

**STUDY ON SOCIO ECONOMIC IMPLICATION OF
INTERNATIONAL CLIMATE CHANGE: EMERGING LEGAL
FRAMEWORK RELATING TO RENEWABLE ENERGY IN
INDIA**

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CERTIFICATE

This is to certify that Shine Kashyap has completed his/her dissertation titled “**STUDY ON SOCIO ECONOMIC IMPLICATION OF INTERNATIONAL CLIMATE CHANGE: EMERGING LEGAL FRAMEWORK RELATING TO RENEWABLE ENERGY IN INDIA**” under my supervision for the award of the degree of MASTER OF LAWS/ ONE YEAR LL.M DEGREE PROGRAMME of National Law University and Judicial Academy, Assam.

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DECLARATION

I, Shine Kashyap, do hereby declare that the dissertation titled “**STUDY ON SOCIO ECONOMIC IMPLICATION OF INTERNATIONAL CLIMATE CHANGE: EMERGING LEGAL FRAMEWORK RELATING TO RENEWABLE ENERGY IN INDIA**”, submitted by me for the award of the degree of MASTER OF LAWS/ ONE YEAR LL.M. DEGREE PROGRAMME of National Law University and Judicial Academy, Assam is a bonafide work and has not been submitted, either in part or full anywhere else for any purpose, academic or otherwise

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List of Abbreviations

AAUs	Assigned Amount Units
AR	Assessment Report
BCM	Billion Cubic Meters
BEE	Bureau of Energy Efficiency
CAMPA	Compensatory Afforestation Fund Management and Planning Authority
CASE	Commission for Additional Sources of Energy
CBDR	Common but Differentiated Responsibilities
CDM	Clean Developed Mechanism
CEDAW	Convention on the Elimination of Discrimination Against Women
CERC	Central Electricity Regulatory Commission
CMA	Conference of parties serving the meeting of the parties to the Paris Agreement
CMP- Kyoto	Conference of parties serving the meeting of the parties to the Kyoto Protocol
COP	Conference of Parties
CPSE	Central Public Sector Enterprise
CPSU	Central Public Sector Undertaking Scheme
CRZ	Coastal Regulation Zone
CSD	Committee on Sustainable Development

CSD-9	Ninth Session of the Commission on Sustainable Development
CSR	Corporate Social Responsibility
CTCN	Climate Technology Centre and Network
DAs	Designated Agencies
EA	Electricity Act, 2003
ECA	Electricity Conservation Act, 2005
ECBC	Energy Conservation Building Code
EIA	Environment Impact Assessment
GCF	Green Climate Fund
GDP	Gross Domestic Product
GHGs	Greenhouse Gas
GW	Giga Watt
HDI	Human Development Index
HRD	Human Resource Development
IAEA	International Atomic Energy Agency
ICCPR	International Covenant on Civil and Political Rights
ICESCR	Covenant on Economic, Social, and Cultural Rights
IESS	India Energy Security Scenarios
IEZ	International Energy Agency
INCCA	Indian Network of Climate Change Assessment
IPCC	Intergovernmental Panel on Climate Change

IRENA	International Renewable Energy Agency
JMA	Joint Mitigation and Adaptation
JPOI	Joint Plan of Implementation of the World Summit on Sustainable Development.
KgOE	Kilogram of Oil Equivalent
kWh	Kilo Watt Hours
LDCs	Least Developed Countries
MNRE	Ministry of New and Renewable Energy
MoEFCC	Ministry of Environment, Forests and Climate Change
MoPNG	Ministry of Petroleum and Natural Gas
MW	Mega Watts
NAMAs	Nationally Appropriate Mitigation Actions
NAP	National Adaptation Plan
NAPAs	National Adaptation Programs of Action
NAPCC	National Action Plan on Climate Change
NBF	Need- Based Funds
NCA	National Conservation Act ,2001
NEP	National Energy Policy
NISE	National Institute of Solar Energy
NIWE	National Institute of Wind Energy
NGO	Non-Governmental Organization
NGT	National Green Tribunal

PAT	Perform, Achieve and Trade
PGCIL	Power Grid Corporation of India
PMUJ	Prime Minister Ujjwala Yojana
PPA	Power Purchase Agreements
PPP	Public Private Partnership
R&D	Research and Development
RCC	Regional Collaboration Centres
RE	Renewable Energy
SD	Sustainable Development
SEforALL	Sustainable Energy for all
SCCF	Special Climate Change Fund
SERC	State Electricity Regulatory Commission
SRM	Solar Radiation Management
STAR	System for Transparent Allocation of Resources
TNA	Technology Needs Assessment
UDHR	Universal Declaration of Human Rights
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
UNHCE	United Nations Conference on Human Environment

UNGA	United Nations General Assembly
USA	United States of America
USD	United States Dollar
VGf	Viability Gap Funding

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Chapter- 1

Introduction

“The climate crisis is both the easiest and the hardest issue we have ever faced. The easiest because we know what we must do. We must stop the emissions of greenhouse gases. The hardest because our current economics are still totally dependent on burning fossil fuels, and thereby destroying ecosystems in order to create everlasting economic growth.”

-Greta Thunberg¹

1.1 Research Background

The air quality index has reached dangerously high levels, and there is contamination of groundwater, receding water tables, and rising sea levels. Rainfall patterns have changed, and there is an increased likelihood of extreme events such as heat waves, floods, forest fires, hurricanes, and the melting of ice caps and glaciers. Climate fluctuations have led to widespread extinction of flora and fauna, strange diseases affecting humans, loss of aquatic life, and the decline of coral reefs due to pollution and rising sea temperatures. The air is being polluted due to unsustainable industrialization, a proliferation of carbon-based fuel vehicles, and the accumulation of plastic and e-waste, which poses a significant threat to the entire ecosystem. The continuous degradation of nature not only affects the current generation but also future ones. However, protecting the environment presents a major challenge to the desire for rapid industrialization, achieving self-sufficiency in food and energy, and providing basic amenities to the entire human race which is a monumental task. Poverty and the negative impacts of development are key contributors to environmental degradation. This work focuses on these aspects as well. Poverty and the lack of resources have a detrimental impact on the health and well-being of our society. The second aspect is the unintended consequences of a competitive race for faster economic growth and development, which overwhelms our poorly planned system and disregards the environment to serve commercial and vested interests. In societies like India, the affluent contribute to environmental destruction through their expensive lifestyles,

¹ Greta Thunberg addressed the House of Parliament and COP24 plenary session December 12, 2019 <<https://www.fridaysforfuture.org/greta-speeches>> accessed 10 April, 2023.

unsustainable patterns of living, and the exploitation of nature for profit. The environment encompasses more than just trees, tigers, endangered species, and ecosystems; it is the foundation on which our entire national system, including agriculture, industry, and the service sector, is built.

The teachings of Mahatma Gandhi continue to be relevant in today's world, despite the unrelenting push for progress and the excessive exploitation of resources that is leading to environmental destruction. Gandhi once said, "There is enough in this world for everybody's need but not for anybody's greed."² The environment serves as a paradigmatic example that demonstrates to us that the activities, we take have repercussions, and it does so without differentiating between those who are wealthy and those who are not. Significant international efforts have been made throughout the course of time, beginning with the Stockholm Conference and continuing through UNFCCC COP 25, the Brundtland Commission, different voluntary contributions meant for nationally decided contributions, and from tackling energy poverty to attempting to achieve sustainable energy for everyone. These endeavours have made significant headway in terms of progress. In addition, there is an increasing desire and a growing consensus that we must acknowledge the truth of climate change and take prompt action, as the window of opportunity to do so is rapidly closing. It is only possible to preserve the natural resources of the Earth for the benefit of both the current generation and the generations to come through the practise of sustainable development (SD). India has established itself as a pioneer in the environmental movement and is deeply committed to the cause. In point of fact, we are one of the countries that has changed its Constitution in order to acknowledge environmental protection as an essential component of both the guiding principles of state policy and the fundamental responsibilities of its inhabitants. The Supreme Court, through its many judicial decisions, has repeatedly emphasised that an essential component of the fundamental right to life and liberty is the basic right to live in an environment that is free from pollution and unfit for human habitation. The Water Act of 1974, the Air Act of 1981, and the Environmental Protection Act of 1986 were all passed into law as a direct result of the extraordinary commitment displayed by both the judicial system and the legislature. While sustainable development may not be explicitly mandated by the law,

² Indu Gupta, 'Sustainable Development: Gandhi Approach' (*papers.ssrn.com* 30 July 2015) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2667226> accessed 1 April 2023.

India has incorporated various international principles in its Constitution, such as “common but differentiated responsibilities”, the “precautionary principle”, the “polluter pays principle”, the “doctrine of public trust”, and the theory of the “common heritage of mankind.”³

Given that India lacks abundant natural resources and is reliant on the Western world to meet its energy demands, a significant amount of money is spent on subsidizing energy and addressing fiscal deficits. To address these challenges and achieve the goals of climate change mitigation and fulfilling energy requirements, the only solution is sustainable development. Thus, in order to realize India's aspirations of global influence and welfare objectives, it is crucial to establish an effective legal framework that supports the growth of the renewable energy sector. This research will primarily concentrate on these aspects and strive to find a balanced approach, suggesting modifications or amendments to the existing legal framework governing the energy sector in India.

1.1.1 Problem of Climate Change

According to a special study named “Climate Change 2022: Mitigation of Climate Change” which was produced by the Intergovernmental Panel on Climate Change (IPCC), it is impossible to reduce global warming to 1.5 degrees Celsius (2.7 degrees Fahrenheit) unless there is an immediate and significant reduction in emissions across all industries.⁴ In the scenarios that were examined, limiting warming to approximately 1.5 degrees Celsius required worldwide emissions of greenhouse gases to peak before the year 2025 at the latest and be lowered by 43 percent by the year 2030. Concurrently, methane emissions would also need to be decreased by approximately a third. According to the findings of the paper, there is growing evidence that action is being taken regarding climate change. The average yearly worldwide emissions of greenhouse gases reached their highest levels in the history of humanity from 2010-2019, but the rate of rise has decreased significantly since then. The adoption of renewable energy sources has been sped up, rates of deforestation have been lowered,

³ Klaus Bosselmann and Pushpa Kumar Lakshmanan, *The Atmosphere as a Global Commons and Cleansing It with New Energy Options* (1st edn Oxford University Press 2018).

⁴ Intergovernmental Panel on Climate Change, ‘AR6 Climate Change 2022: Mitigation of Climate Change— IPCC’ (www.ipcc.ch/2022) <<https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/#:~:text=The%20IPCC%20has%20finalized%20the>> accessed 2 April 2023.

and improvements in energy efficiency have been made as a result of a growing number of rules and laws.

The emission of carbon dioxide is primarily attributed to the global energy infrastructure. Therefore, it is imperative to mitigate greenhouse gas emissions originating from the energy sector with the aim of minimising the adverse effects of global warming. If the world is able to successfully restrict global warming to far below 2 degrees Celsius, the energy systems of the future will be considerably different from those that exist today. In the future, the generation, conversion, and application of energy will look very different from what they do today. The accomplishment of these changes and the manner in which they are responded to present an impressively wide variety of problems and opportunities. The researcher identifies two primary goals for the project. In the first place, it intends to evaluate particular, individual mitigation measures in the fields of energy supply, energy transportation, transmission as well as energy transformation. Second, the term “energy systems” refers to a wide concept that encompasses both the physical and the sociological aspects of the topic. Changes in energy systems are still being driven by forces that are not related to climate. Although alterations to the energy system are essential to climate change mitigation, more recent alterations to the energy system have occurred in reaction to a far wider range of external causes. Several factors, such as economic growth, energy accessibility, energy justice, energy security, air pollution, advancements in low-emission technology, and the generation of local employment opportunities, constitute significant considerations.⁵

The climate change issue can only be addressed either by mitigation and adaptation. Adaptations in the context of climate change, includes the measures taken to limit the unfavourable effects of climate change. Mitigation includes measures to reduce the emissions of GHGs that cause climate change like shifting from traditional to RE in spite of burning fossil fuel in thermal power stations. India’s expenditure on adaptation has been increased considerably during the last decade. (UNEP) stated the estimated cost of adaptation would be 300 billion dollars by 2030. So, the poor, developing and the third world countries are the major sufferers of this menace. Transitioning to renewable energy and other alternative sources is not merely the optimal decision given

⁵ Thomas B Johansson and others, *Global Energy Assessment: Toward a Sustainable Future*. (3rd edn., International Institute for Applied Systems Analysis 2012).

the current conditions, but rather the sole viable option. This is due to the ongoing depletion of conventional oil and gas reserves, coupled with the extensive harm caused by fossil fuels. Customary International Law principles like Common Heritage of Mankind rested on long standing tradition all cultures that one cannot own what essentially belongs to all.

The essential principles of *Erga omnes and Jus cogens* need to be articulated in a clear way and given priority in order to be the most effective strategy for protecting our planet and the natural legacy it has left for both the current generation and the generations to come.⁶ In its ruling regarding the *Barcelona traction case*, the International Court of Justice stated that “the obligations of States towards International community are the concerns of all state and they all have obligations to protect them.”⁷ Instead of adhering to the precautionary principle, it is critical that states deal with the issue of atmospheric pollution by adhering to the principles of prevention and the polluter- pays system. Establishing a rigorous framework of accountability is imperative for individuals tasked with addressing environmental issues, such as atmosphere contaminants and global warming. In view of the ever-increasing negative impact that climate change and air pollution are having, the states are obligated to formulate their policies using an approach that incorporates the concepts of inter-generational justice and intra-generational equity into their own domestic legislation. This is to be done in light of the fact that these two factors are interrelated.

1.1.2 Evolution of Global Climate Change Policy

The existing global legal framework on climate change serves as evidence that significant achievements require time and continuous dedication, even though we encounter challenges in attaining exactness. In this pursuit to achieve a universal and binding legal structure on an international level to tackle the obstacles arising from climate change, there have been notable achievements as well as setbacks. The imperative to address climate change necessitates the establishment of international collaboration, promotion of equality, prevention of discrimination, enforcement of accountability, and pursuit of equity, all of which are in accordance with human rights

⁶ United Nations General Assembly, ‘Chapter v Peremptory Norms of General International Law (Jus Cogens)’ (2015) <<https://legal.un.org/ilc/reports/2019/english/chp5.pdf>> accessed 27 April 2023.

⁷ International Court of Justice, ‘Barcelona Traction, Light and Power Company, Limited (Belgium v. Spain) (New Application: 1962)’ (www.icj-cij.org1962) <<https://www.icj-cij.org/case/50>> accessed 5 April 2023.

obligations. The Declaration on the Right to Development places significant emphasis on the crucial aspect of ensuring the equitable distribution of development benefits. Additionally, it emphasises the need for developed nations to offer assistance to developing countries, highlighting the crucial importance of attaining equitable and ethical development. However, to understand the origins of the global climate change framework, one must look back to November 1988 where the undertaking and consortium of the Intergovernmental Panel on Climate Change (IPCC) occurred through a collaborative effort between the United Nations Environmental Programme and the World Meteorological Organisation. The Intergovernmental Panel on Climate Change (IPCC) have influential role in the advancement of scientific knowledge pertaining to climate change and providing valuable assessments and recommendations to guide international actions. The IPCC has significantly contributed in the advancement and extension of the global climate change policies. It releases its record in the form of Assessment Reports which is actually the scientific underpinning of worldwide climate negotiations.

The first Assessment Report of IPCC was released in November 1990 and it emphasized the consequences of emissions and the increase in human-induced greenhouse gas concentrations in the atmosphere, attributing them to various human activities.⁸ Later on, the International Negotiating Committee was established by the UN General Assembly on December 11, 1990 which was on the nascent stage of the climate change negotiations. This ultimately which led to the approval of the document in its final form of the United Nations Framework Convention on Climate Change (UNFCCC) in May 1992. The United Nations Framework Convention on Climate Change (UNFCCC) acknowledges “the principle of equity, which encompasses inter-generational equity. It calls upon all participating parties to safeguard the climate system for the advantage of both present and future generations, guided by the principles of fairness and taking into account their distinct responsibilities and capacities.”⁹ The issue of greenhouse gas emission was also addressed by the two other subsidiary convention i.e., Convention on Biological Diversity and Convention to Combat Desertification. On March 21, 1994, the UNFCCC finally entered into force with fifty countries ratification, and later first Conference of Parties (COP) to the said

⁸ UN, Climate Negotiation Timeline, <<https://www.un.org/sustainabledevelopment/climate-negotiations-timeline/>> accessed 2 May 2023.

⁹ *Ibid.*

convention was held in Berlin. Here, “Berlin Mandate” was adopted which laid grounds for the Kyoto Protocol. It was ratified, thereby establishing the first international agreement with the purpose of cutting emissions of GHGs. The primary goal of the protocol is to reduce global emissions of human-generated greenhouse gases by implementing a legally binding international standard. This entails all participating state parties committing to addressing the detrimental effects of climate change. “The protocol adopted three market-based mechanisms that are Clean Development Mechanism (CDM), Joint Implementation (JI) and International Emission Trading.”¹⁰

Subsequently, on December, 2012, the Doha Amendment was adopted by the Kyoto Protocol which brought about an updated version of the revised list of greenhouse gases (GHGs). In the same year, the Marrakesh Accords was adopted with the aim to enhance transparency, accountability, and compliance with the obligations set forth in the Kyoto Protocol. It provided a framework for regular review processes, reporting requirements, and the establishment of a compliance mechanism to ensure that countries are meeting their commitments. It provided a clear road-map for addressing climate change mitigation and adaptation measures at the international level. At COP 13, the Bali Roadmap was adopted in order to secure a resilient climate future by including mitigation, adaptation, financing, technology and shared vision. At COP 16, Cancun Agreements were adopted, this led to establishment of the Green Climate Fund. At COP 18, Doha Amendment to Kyoto Protocol was deployed in order to accomplish the objective in question to reduce GHG emissions by 18% compared to 1990 levels. At COP 22 in Lima, the parties collectively contributed to propelling the universal agreement on climate change forward, and finally, on December 12, 2015, during the 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC), a historic moment occurred as 195 nations reached a unanimous agreement. They committed to collectively undertake actions towards a future characterized by reduced carbon emissions and increased resilience to address the challenges posed by climate change. During COP21, the member nations came together and forged the Paris Agreement, which aimed to limit global warming to well below 2 degrees Celsius above pre-industrial levels, while striving to keep it below 1.5 degrees Celsius. The agreement emphasized the importance of greenhouse gas emissions

¹⁰ United Nations, ‘What Is the Kyoto Protocol?’ (UNFCCC2019) <https://unfccc.int/kyoto_protocol> accessed 25 May 2023.

mitigation, adaptation to the impacts of climate change, and providing financial support to developing countries. The Paris Agreement represents a pivotal milestone in international climate diplomacy, as it achieved universal participation with all nations committing to taking measures to combat climate change. This historic event demonstrated a collective commitment to working towards a sustainable and climate-resilient future. At COP 26, India announced Net Zero Targets 2070 and called for “phase- down” of coal-based powers. During the Conference of the Parties (COP), financial resources were mobilised to support the implementation of climate change policies specifically aimed at addressing loss and damage. In conclusion, the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) has played a pivotal role in shaping global efforts to address climate change. COP has served as a platform for dialogue, knowledge sharing, and the exchange of best practices. It has brought together policymakers, scientists, civil society organizations, and other stakeholders to address the complex issues related to climate change and find common ground for action. Thus, COP remains a crucial forum for addressing climate change, and the collective efforts of nations are vital in achieving a sustainable, low-carbon, and irreplaceable future for our planet. It is imperative that we continue to build on the progress made and forge ahead with unwavering commitment to combat climate change and safeguard the well-being of current and future generations.

1.2 Statement of Problem

Energy is considered as the barometer of growth for any country. As India’s economy continues to grow at a pace of 8% and in the days to come India poised to become the 3rd largest economies having GDP of 5 trillion in the world surpassing many European countries, the biggest challenges that India has to face is too commensurate the supply of energy and to meet out the energy demand sufficiently. India has a deficit of rich energy resources and has to rely heavily on the western world for our future energy demands because the energy generated from conventional sources like coal, and crude oil is cheap as compared to the alternative sources of energy. Starting from 1972 our leaders have recognized the importance of environment, clean and green future and as a result various legislative, constitutional and policy frameworks have been brought in. Due to these efforts the UN General Assembly has many times appreciated our efforts and contributions in the field of climate change and described India as a global leader

which shows the path of a clean and green future for the present and generations to come. In order to achieve equilibrium between the divergent concerns regarding development, which means to provide basic needs to the people, alleviating them out of poverty, meeting their energy demands and ensuring energy security, versus preservation of environment, and mitigating climate change, it is crucial to achieve a harmonious equilibrium between two opposing factors. The solution can be found in pursuing sustainable development. The global community has repeatedly emphasized that sustainable development encompasses the provision of efficient, affordable, and clean energy. Historically, both before and after Independence, the government held a monopoly over the energy sector due to its status as a public interest industry. However, following 1991, governments made certain concessions and liberalizations to foster the growth of this sector. If we look at various countries around the world, many countries have started shifting their energy demands from conventional to renewable by employing new techniques, formation of legal, financial, institutional and regulatory framework which not only serves the energy sector, but covers many objectives like the climate, the job, economy, basic needs of the people. Energy is not only an area but can be said as the driver of socio- economic growth, covering all the aspects of human life. Despite many laws governing the energy sector and keeping in view potential and size of the country it seems that India has not achieved much and a failure to focus on this sector will certainly impact the forth coming generations. Hence, the researcher tries to find out the answer to these questions through this research.

1.3. Detailed Literature Review

Helm and Hepburn (2009)¹¹ had critically examined the path to the environmental jurisprudence, agreements, analyzing the economics of the change in climate as well as the administrative policies adopted by the global power countries and nations that are developing in order to reduce the emission of greenhouse gases and ultimately helped to shift the financial stance of the countries onto a low carbon emission goal. In-depth research conducted on the existing issues and potential directions for climate change law faced by underdeveloped countries, including all anticipated hazards, as well as the role and contribution of the smaller economies in achieving the goals set forth in the Paris Agreement has been examined. Developing countries encounter numerous

¹¹ Dieter Helm and Cameron Hepburn, *The Economics and Politics of Climate Change* (Oxford University Press 2011).

obstacles when engaging in negotiations for a fresh global legal framework concerning the Clean Development Mechanism, adaptation, and mitigation. With the initial Kyoto era ending in 2012, the global framework for a climate change accord is up for review. The underlying economics and politics remain very contentious, despite the enthusiasm of political and environmental organizations.

Sarkar (2009)¹² had examined extensively various connected threads to the regime of energy, for instance, climate change problems and financial evolution in the context of the Indian legal system. The author has thoroughly examined the potential of renewable energy, including bio-fuels and rural electrification, wind and biomass energy, solar, hydro-power, and municipal solid waste management, roles and responsibilities of the government authorities. This book offers useful and up-to-date statistics on the scientific foundation of global climate change, the variables used that determine the effects of various guidelines and projects strategies to abattoir the impacts from climate change and limits the emission of GHGs, as well as the relationship between climate and energy stability in order to nurture a prolonged vision to the development of sustainable energy as an integral global initiative in the future. The author has also talked about the genesis and implications of the Kyoto Protocol in detail as well as probable CDM initiatives that could be set up in India with various suggestions.

Boyle (2010)¹³ had examined the energy system and the concept of sustainability in a comprehensive volume, both stage of evolution and the merits of technologies that are used to utilize the renewable form of energy. This book offers an intriguing look into the future possibilities for green power, embarking on the assessment of the core energy conversion processes, moving on to a study of various renewable sources, and closing with an evaluation of the chances for their incorporation in domestic and international infrastructures. The author has not only described the potentials of energy but also persistent problems and solutions at length. As political and economic pressures push society towards a low-carbon future, the study takes emissions, continuous, imperishable, cost implications, and energy security into account. The author illustrates the basics of the physical and technological concepts behind producing electricity using direct solar energy (solar thermal and photovoltaic), non-solar energy (tidal and

¹² AN Sarkar, *Global Climate Change and Sustainable Energy Development* (Pentagon Press 2009).

¹³ Godfrey Boyle and Open University, *Renewable Energy: Power for Sustainable Future* (Oxford University Press in Association with the Open University 2010).

geothermal) and indirect solar energy (biomass, wind, hydro and wave), in relation to the setting of their ecological effects, finance, and potential in the future.

Richardson, Bouthillier and Kilmurray (2010)¹⁴ had done a detailed critical analysis of the limitations and obstacles in order to accomplish the objectives of international conventions and agreements. The study also looks at stimuli in advanced economies, including the USA, China, and the European Union, which are nations with proficient intellectual and technological capabilities. The study demonstrates how exploitative colonial authority continues in developing nations despite becoming independent. The researcher has also looked at stimuli in advanced economies, including the European Union, the United States and China, which are nations with proficient intellectual and technological capabilities and the rationale that demonstrates how exploitative colonial authority continues in developing nations despite being independent. The book has also given a comprehensive idea of climate justice, clean development mechanisms, climate change legal regimes, broad scope of energy law, and the mitigation blueprint connecting the north and the south.

Quirico and Boumghar (2015)¹⁵ had analyzed and focused on the regulatory implications of human rights with the imminent danger of the climate change marked on global warming. These threats to foreseeable fundamental rights additionally endorse Ulrich Beck's concept of the "risk society". The researcher has examined a study that provides valuable insights into a wide-ranging and captivating subject, focusing on the significant hurdles faced in establishing a sustainable environment to address challenges related to causality and imputation. The results of the research suggest the most practical analysis of existing and probable positive supervision, explaining its potential, shortcomings and constraints in comparison to a consistent pragmatic approach to the fundamental commitments.

Bodansky, Brunnée and Rajamani (2017)¹⁶ had given a comprehensive outline of the international climate change law that provides students with an appropriate introduction to the subject matter. An interrelation between the human rights law and climate change

¹⁴ Benjamin J Richardson and others, *Climate Law and Developing Countries: Legal and Policy Challenges for the World Economy*, New Horizons in Environmental and Energy Law (Edward Elgar Publishing 2010).

¹⁵ Ottavio Quirico and Mouloud Boumghar, *Climate Change and Human Rights: An International and Comparative Law Perspective* (Routledge 2015).

¹⁶ Daniel Bodansky, Jutta Brunnée and Lavanya Rajamani, *International Climate Change Law* (Oxford University Press 2017).

trade law and migration law has been depicted. The researcher has done an exhaustive analysis of the components of international climate change law and its establishment. This book also depicts that since early 1990's, the environment has been injured and suffered a lot because of certain national policies of the developed states. The Paris Agreement demonstrates how the world is supporting, adapting to, and understanding climate change and its obstacles. It additionally addresses climate financing, adaption methods, and mitigation techniques.

Gerrad and Hester (2018)¹⁷ had confirmed and examine climate change as a global threat. So, the authors have focused on the legal stance of technology used such as how liability would be determined and compensation given in the event of a catastrophe; what regulatory authorization might be needed; and how a framework for governance could be generated and internationally acknowledged. There are two primary methods being considered to address the issue: reducing the amount of solar radiation reaching the Earth's surface, potentially through the release of aerosols into the stratosphere from airplanes (a controversial and risky approach), and the process of extracting carbon dioxide from the Earth's atmosphere. (which would necessitate substantial land, financial resources, and several decades to accomplish). It is acknowledged that human-induced climate change poses the most widespread hazard to the ecology and environment, with developing countries bearing the brunt of its impact. As a result, there has been a growing focus on climate engineering as a deliberate and widespread approach to deliberately altering the environment, with the objective of mitigating the impacts of climate change and averting its most severe outcomes.

Popovski (2018)¹⁸ had observed that the international framework for combating the effects of climate change has made significant strides to the regulation, but its practical implementation is still a complicated and uncertain problem. The book provides a comprehensive exploration of international environmental agreements, delving into their implications, limitations, and strategies to strengthen them. It encompasses a combination of soft and hard laws, highlighting the Paris Agreement's emphasis on equity and parallelism compared to the UN Framework Convention on Climate Change (UNFCCC). Although the Paris Agreement's alleviating burden policy promises to be

¹⁷ Michael Gerrard and Tracy Hester, *Climate Engineering and the Law Regulation and Liability for Solar Radiation Management and Carbon Dioxide Removal* (Cambridge, United Kingdom New York, Ny, USA Cambridge University Press 2018).

¹⁸ Vesselin Popovski, *The Implementation of the Paris Agreement on Climate Change* (Routledge 2018).

practical, the politics of allocating finances is a concern for the prosperity of underdeveloped and less developed countries.

Tandon (2018)¹⁹ had analyzed the significant aspects of the international energy legal framework such as energy trade, global climate governance, energy access and justice, taxation and intellectual property in clean energy. The author has not only essentially observed India's participation in the global field of energy law, but also analyzed by comparative study of domestic legal frameworks of various countries such as China, Mauritius, Nigeria and India on topics such as nuclear energy, conservation of energy resources and clean renewable energy. The book is a beautiful compilation of essays from the finest renowned jurists including Klaus Bosselmann, Richard Lottinger, Upendra Baxi, Sanjay Upadhya, Mansi Verma who have extensively addressed the atmosphere as a common human heritage, the statutory and conceptual aspects of the environment, and the link between nuclear energy and sustainable development. The WTO regulations on energy present various intellectual challenges related to technology and equipment, particularly concerning the implementation and adoption of clean energy initiatives in India. The researcher has tried to incorporate the critical analysis of the conservation law and the work written by the author in this book.

Basak (2021)²⁰ had discussed and significant topic of our time, carrying implications for both current and future generations. Over the past two decades, there has been a growing recognition of the urgency to address the vulnerabilities and risks that are interconnected with the climate change. India, as a country with its own unique socio-economic aspirations and challenges, is particularly vulnerable to the impacts of climate change. In response to these challenges and in pursuit of sustainable goals, numerous climate-resilient actions have been undertaken at both the international and domestic levels through the implementation of various laws and policies. The author aims to delve into these measures and present them to readers who are concerned about the environment. It is important to acknowledge that the subject of Climate Law and Policy is vast and continuously evolving, making it impossible to cover all aspects in a single piece of literature. However, this publication strives to provide a simplified overview of its essential elements, making it accessible to scholars engaging in multidisciplinary

¹⁹ Usha Tandon, *Energy Law and Policy* (Oxford University Press 2018).

²⁰ Dr. Chiradeep Basak, *Global Climate Change and Environmental Laws in India* (Thomson Reuters 2021).

studies. The intention of this work is to contribute to the broader discourse on climate change, serving as a valuable resource for individuals interested in understanding the legal and policy frameworks surrounding this critical global issue. By presenting the key measures and initiatives, this publication seeks to promote a deeper understanding and stimulate further research and discussion revolves around the topics of climate change and environmental conservation, particularly within the context of India and its global implications.

Uddin (2021)²¹ had observed that it is the basic notion that we need to advance technology to reduce our reliance on fossil fuels and natural resources, as innovation is the best course option in the present situation. The book is apprehension that the concept of sustainable development aims to reduce greenhouse gas emissions without jeopardizing economic growth or impairing access to basic requirements. Technologically advanced nations must address and overcome the challenges associated with patent, design, and copyright regulations when transferring technologies while assisting emerging and least developed countries. In contrast, advanced countries can more readily facilitate the transfer of technologies.

Viñuales (2022)²² had given an in-depth assessment of international energy law and examines how contemporary energy change affects theoretically and real- world strategy dimensions of the international legal regime. The author has noted that while the energy sector is subject to considerable international legal oversight, its boundaries have not been adequately defined. Despite the existence of numerous legal sources that contribute to energy governance, they are scattered across a wide legal landscape. This fragmented structure perpetuates and exacerbates the global ecological crisis, necessitating substantial regulatory reform to address the issue effectively. The study adopts the past, present, and probable future of global energy administration by integrating conceptual and doctrinal assessments of all the major laws, procedures, and authorities.

1.4 Aim of the Study

²¹ Md Mahatab Uddin, *Climate Change Law, Technology Transfer and Sustainable Development* (Routledge 2021).

²² Viñuales Jorge E, *The International Law of Energy* (Cambridge University Press 2022).

In the light of brief introduction and analysis of the research problem, the research aims to examine the obstacles and potential opportunities associated with utilizing renewable energy as a means to accomplish the goals of sustainable development within the framework of the international climate law. It also seeks to emphasize the feasibility of establishing a dedicated legal framework for the promotion and allocation of renewable energy resources. The aim of the study will be achieved by analyzing the current laws, policies and programs of the Government of India in order to safeguard India's future necessities, encourage renewable sectors as well as combat climate change.

1.5. Objectives

The present research will include the following objectives:

1. To examine the issue of climate change from a global perspective.
2. To analyse the social, economic, and the legal implications of climate change on India.
3. To study the international framework on the development of the renewable energy sector.
4. To study the relationship and importance of the renewable source of energy in contemplation of achieving the goal of sustainable development.
5. To study the national policy framework associated with renewable energy in India.
6. To examine the judicial perspective on renewable energy and climate change in the context of India.
7. To suggest measures to integrate and attenuate the effects of climate change in India.

1.6. Scope and Limitations

The scope of energy law is quite comprehensive and wide as it incorporates the usage and taxation of both renewable and non-renewable sources of energy. However, in this particular study, the researcher has focused specifically on the non-conventional sector within both the international and national frameworks.

1.7. Research Questions

1. Whether the renewable form of energy attenuate climate change.

2. What are the socio- economic implications of the climate change on India?
3. What are international policies and legislative practices that deal with renewable energy?
4. What is the notion of sustainable development in developing renewable energy as an alternative source of energy?
5. What is the current state of energy sector in India?
6. What are the legal regulations pertaining to renewable energy in India?
7. What are the roadblocks limiting India's renewable energy sector from expanding?
8. How the judiciary has dealt with the challenges to adopt the renewable energy to mitigate the climate change in India?

1.8. Research Methodology

The legal research methodology embraced under the dissertation is based on doctrinal legal research which consists of qualitative and analytical techniques. The literature for the purpose of study has been collected from both primary as well as a secondary source of data. Primary sources encompass various legal materials such as legal texts, legislation, rules, circulars, notifications, case laws, court records, official documents, international conventions, and agreements. Additionally, secondary sources include books, law journals, news articles, reports, encyclopaedias, the Oxford dictionary, essays, and web resources. The referencing style used for mode of citation is OSCOLA fourth edition, i.e., the Oxford University Standard for the citation of legal authorities.

1.9. Chapterization

The **First Chapter** entitled as '**Introduction**' provides a brief introduction to the overview and the basic introduction of environment and climate change in general. The researcher has dealt with the problem and the evolution of climate change which has become a global threat to human beings and ecology. A clear description of the problem undertaken, need and reasoning, aims and objectives of the study, research questions, scope and limitations of the citation to justify the area of research, referencing style of citation and research methodology along with literature review have been clearly defined. Further, this chapter has provided an overview of the following chapters.

The **Second Chapter** entitled as ‘**Socio- Economic Implication of Climate Change affecting Human Rights**’ describes the consequences of climate change on human rights are examined. Human rights are fundamental and indivisible rights, rooted in the inherent dignity, compassion, and equal value of every individual. Though the Universal Declaration of Human Rights, 1948 (UDHR), is the first non-binding international instrument which protects human rights all across the world, it is not its weakness, but it’s its major advantage because of its great flexibility. The concept of the mitigation and adoption in context of climate change is also highlighted in this chapter. The researcher has undertaken a comprehensive analysis, considering a multitude of details and data, to examine the recent climate changes that have had far-reaching effects on both human and natural systems. It is evident that individuals who are marginalized in terms of their social, economic, cultural, political, institutional, or other circumstances face heightened vulnerability to the impacts of climate change. Furthermore, these vulnerable populations are also disproportionately affected by various adaptation and mitigation measures.

The **Third Chapter** entitled as ‘**Development of International Framework on Renewable Energy**’ focuses on the efforts made by the world community in bringing climate change debates at centre stage. After close examination of international conventions, declarations and conferences the researcher came to the conclusion that Sustainable development is widely accepted phenomena and the latest researches and development have unequivocally concluded that sustainable development is the only solution to climate change. This chapter also explores its dimensions to the interconnection between two different dimensions of the sustainable development and renewable energy, culminating in the emergence of a novel concept known as sustainable energy through extensive deliberations at the global level. This concept highlights the integration of environmental, social, and economic considerations in the pursuit of energy solutions that support long-term sustainability. The objective behind Sustainable energy is to make energy cost-effective, clean and accessible to all. Sustainable energy has achieved the status of basic standards and norms which every country should incorporate in their domestic legislation while framing any energy specific legislation.

The **Fourth Chapter** entitled as ‘**Legal Framework Related to Renewable Energy in India**’ examines the interface between law and energy in India. It focuses on the

current state of energy sector in India, Potential in the RE sector, legal, institutional and regulatory framework is widely discussed in this chapter, the position of the RE in Indian constitution, the judicial approach in dealing with Renewable energy and various impediments which are diluting India's effort to become self- sufficient in power has been elaborately discussed here. Furthermore, the concept of sustainable energy mitigating the climate change is explained with the help of the current legal framework of the nation. The potential of the RE in developing country like India is being analyzed with the help of relevant tables and figures. The researcher has also examined various national policies and missions that have helped India to achieve the goals which it targeted to achieve. The contribution of the various institutional framework in the expansion of the sustainable RE economy mix in the country are also provided.

The **Fifth Chapter** entitled as '**Conclusion and Suggestions**' aims to propose measures to enhance a specific sector that has been largely overlooked but holds significant importance. As a result, research primarily concentrates on assessing the present condition of the renewable energy sector in India and the challenges that are faced by India to achieve sustainable energy. Further, it suggests some legislative and administrative changes so that the potential of this sector can be actualized in practice. Some of the suggestions include measures to achieve self-reliance, affordable, clean, and accessible energy for the objective of sustainable environment and climate.

Chapter- 2

Socio- Economic Implication of Climate Change on India affecting Human Rights

2.1 Introduction

As is widely recognised, human rights are inherent and universal legal guarantees that shield people and organisations from acts or negligence that impede their fundamental liberties and privileges. These protections are designed to shield everyone against actions or carelessness. These guarantees are in place to ensure that human rights are upheld everywhere in the world. These rights are inherent to all human beings and are grounded in the principles of inherent dignity, care, and equal value. They are indivisible, interconnected, and interdependent, meaning they cannot be separated or waived, even by governmental authorities. It is impermissible to infringe upon the rights of others, as human rights are protected universally by law and cannot be revoked by anyone, including the government. It is imperative for administrations and their officials to adhere to legal obligations in upholding, promoting, protecting, and fulfilling the entirety of human rights for their respective citizenry.²³ Human rights impose obligations on states and their representatives, establishing standards for their conduct and ensuring accountability for both their actions and omissions. The UN Declaration of Human Rights, 1948 (UDHR) is considered as the milestone instrument in the history of human rights. Its main objectives are: firstly, adherence to the principle of non- discrimination, and secondly, allegiance to the inherent dignity of every individual. Human rights emanate from the fundamental value and worth of every individual, serving as the bedrock for global freedom, justice, and harmony. They are commonly referred to as ethical principles that every person should strive to achieve. These rights are interconnected, meaning that the infringement of one right inevitably results in the violation of other rights as well. According to the Secretary General of the United Nations, Ban Ki-moon, “climate change poses a significant threat to our ability

²³ Understanding Human Rights and Climate Change, Submission of the Office of the High Commissioner for Human Rights to the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change, <<https://www.ohchr.org/Documents/Issues/ClimateChange/COP21.pdf>> accessed 21 April 2023.

to attain sustainable development, and in certain cases, it even jeopardizes human lives.”²⁴ In the United Nations Resolution 26/27, Human Rights Council highlights the severe magnitude of climate change as a worldwide issue spanning all nations that requires a concerted effort from countries all over the world to find a solution.²⁵

Climate change has become an undeniable truth that has ramifications in every part of the globe. It is evident that climate change directly influences human rights. It has introduced significant unpredictability into human existence, leading to a multitude of challenges. These include the presence of contaminated air and water, inadequate living conditions, compromised hygiene, insufficient food security, the emergence of climate refugees, shortages in healthcare services, heightened poverty rates, crop failures, the expansion of saline and barren land areas, rising sea levels,²⁶ the escalation of natural disasters such as droughts, floods, and cyclones²⁷ and the increasing temperatures are leading to notable transformations in the Arctic ecosystems, which are essential for the sustenance of numerous indigenous communities.²⁸ The approach of integrating aspects of the human rights into the aspects of climate is essential in our daily lives and requires responsive and adaptable laws.

These laws should not be rigid but instead flexible enough to ensure justice in accordance with the prevailing circumstances. This necessitates the need for timely and informed decision-making that considers social needs, resulting in practical and genuine laws known as “Social Product/Law.” These laws are designed to address specific social concerns and are not subject to interference from higher authorities unless a disadvantaged individual seeks recourse in a higher court. In essence, these

²⁴ Understanding Human Rights and Climate Change, Submission of the Office of the High Commissioner for Human Rights to the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change, <<https://www.ohchr.org/Documents/Issues/ClimateChange/COP21.pdf>> accessed 21 April 2023.

²⁵ *Ibid.*

²⁶ Anthony Oliver-Smith, *Sea Level Rise and the Vulnerability of Coastal Peoples. Responding to the Local Challenges of Global Climate Change in the 21st Century* (InterSecTions 2009).

²⁷ John Magrath, ‘Entering Uncharted Waters: El Niño and the Threat to Food Security’ (*Oxfam International* 25 May 2022) <<https://www.oxfam.org/en/research/entering-uncharted-waters-el-nino-and-threat-food-security>> accessed 9 June 2023.

²⁸ Sheila Watt-Cloutier, ‘Petition to the Inter-American Commission on Human Rights Seeking Relief from Violations Resulting from Global Warming Caused by Acts and Omissions of the United States - Climate Change Litigation’ (*Climate Change Litigation* 2016) <<http://climatecasechart.com/non-us-case/petition-to-the-inter-american-commission-on-human-rights-seeking-relief-from-violations-resulting-from-global-warming-caused-by-acts-and-omissions-of-the-united-states/>> accessed 1 June 2023.

rules should be rational, flexible, and practical, rather than imposing norms or being inflexible in nature. It is crucial to learn from our experiences and implement such laws at both the municipal as well as international levels to promote human rights and achieve climate justice. These issues are delicate and directly impact human well-being and should be treated with utmost care and consideration.

The climate system exhibits clear evidence of human influence, as stated in the Fifth Assessment Report (AR5) which was circulated by the Intergovernmental Panel on Climate Change (IPCC). The report provides that “greenhouse gas emissions resulting from human activities are at their highest levels in history.”²⁹ These emissions have resulted in substantial and extensive consequences for both human and natural systems. The report provides conclusive evidence that the phenomenon of climate system warming is irrefutable and many of the observed changes since the 1950s have been unprecedented over extended periods of time. It is evident that both the atmosphere and the ocean have experienced warming, the presence of snow and ice has significantly reduced, and sea levels have risen. The Intergovernmental Panel on Climate Change (IPCC) in its Report 1 of Sixth Assessment Report (AR6)³⁰ clearly stated, “it is evident that human activities have had a clear impact on the climate system, and the emissions of greenhouse gases caused by human actions are currently at their highest levels ever recorded in history.”³¹ As of January 31, 2023, India holds the distinction of being the third-largest global producer and consumer of electricity and it also has one of the most amazing capacities in terms of the amount of power that is actually installed which is 411.64 GW.³² Additionally, India has made significant strides in renewable energy development, with an installed capacity of 168.4 GW (including hydro), accounting for 40.9% of the country’s total installed power capacity.³³ The data shown here demonstrates that India has made significant strides towards adopting and utilising RES to meet the increasing demand for electricity. In India, the protection of human rights

²⁹ IPCC, *Climate Change 2014: Impacts, Adaptation, and Vulnerability, Contribution of the Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press 2014).

³⁰ The Working Group I report is the first instalment of the IPCC’s Sixth Assessment Report (AR6), which will be completed in 2022.

³¹ IPCC Press Release, *Climate change widespread, rapid, and intensifying* (2021) <https://www.ipcc.ch/site/assets/uploads/2021/08/IPCC_WGI-AR6-Press-Release_en.pdf> accessed 2 May 2023.

³² IBEF, India Brand Equity Foundation, *Power Sector in India*, <<http://ibef.org/industry/power-sector-india.aspx>> accessed 4 May 2023.

³³ *Ibid.*

is enshrined under Part III of the Constitution of India, which outlines the Fundamental Rights. On a global scale, human rights are safeguarded by the Universal Declaration of Human Rights (UDHR) adopted in 1948. The UDHR is a significant milestone in the history of human rights, aiming to establish a common standard of achievements for all individuals and nations, ensuring the protection of fundamental human rights universally. Complementing the UDHR are two key instruments: the International Covenant on Civil and Political Rights (ICCPR) and the International Covenant on Economic, Social, and Cultural Rights (ICESCR). Together with the UDHR, these two covenants constitute the International Bill of Human Rights. While the UDHR itself is non-binding, the ICCPR and ICESCR are legally binding documents that have been ratified by a majority of countries worldwide. These covenants enforce most of the human rights outlined in the UDHR. Numerous legally binding international treaties have been established based on the principles of the UDHR, such as the International Convention on the Elimination of All Forms of Racial Discrimination, the International Convention on the Elimination of Discrimination Against Women (CEDAW), the United Nations Convention Against Torture (CAT), and the United Nations Convention on the Rights of the Child (CRC), among others.

2.2 The element of Mitigation and Adaptation³⁴

Climate change is a highly intricate issue confronting humanity in the present era. Its multifaceted nature encompasses scientific, economic, societal, political, and moral dimensions. It is a global problem with local manifestations, expected to persist for thousands of years. The primary contributor to global warming is carbon dioxide, a GHG that remains in the air or atmosphere for an extended period. The planet, particularly the oceans, requires considerable time to respond to the effects of warming. Hence, in the event that all emissions of greenhouse gases were to abruptly cease, it is important to recognise that subsequent generations would still experience the consequences of global warming and climate change. Hence, humanity is unavoidably “committed” to some degree of climate change. Numerous adaptation and mitigation strategies are available to tackle climate change, but no individual option is capable of single- handily addressing the issue. Successful implementation requires the

³⁴ Intergovernmental Panel on Climate Change, ‘Topic 4: Adaptation and Mitigation’ (*IPCC 5th Assessment Synthesis Report*2023) <https://ar5-syr.ipcc.ch/topic_adaptation.php#content_4> accessed 2 June 2023.

collaboration and formulation of policies at various levels, considering the interconnectedness of societal objectives. Integrated responses that effectively combine mitigation and adaptation measures with other societal goals can further enhance our ability to combat climate change. Addressing climate change necessitates a dual approach that encompasses two main strategies. Firstly, there is a need to decrease emissions of and stabilize the concentrations of heat-trapping greenhouse gases in the atmosphere, commonly referred to as “mitigation.” This involves implementing measures to reduce the release of these gases into the environment. Secondly, it is imperative to acknowledge and respond to the essential necessity of adjusting to both current and anticipated consequences of climate change, known as “adaptation.” This involves implementing strategies and measures to manage and cope with the changes that are already occurring or expected to occur due to climate change.

Mitigation, a crucial aspect of addressing climate change, the central focus is on the reduction of the introduction of heat-trapping greenhouse gases into the Earth’s atmosphere. The reduction of greenhouse gas emissions can be accomplished through the implementation of measures that limit the combustion of fossil fuels for electricity generation, heating, and transportation., as well as enhancing the natural “sinks” that capture and store these gases, including oceans, forests, and soil. The principal objective of mitigation is to avert substantial human intervention in the Earth’s climate by maintaining GHGs levels at a stable state within a span of time that permits ecosystems to spontaneously adjust to climate variations. This approach also aims to safeguard food production, enable sustainable economic development, as outlined in the 2014 report on Mitigation of Climate Change by the United Nations Intergovernmental Panel on Climate Change.³⁵ On the contrary, adaptation encompasses adjusting to present and anticipated future climate conditions. Its objective is to minimize the risks posed by the adverse impacts of climate change, such as rising sea levels, more frequent and intense extreme weather events, and food insecurity. Adaptation measures are designed to mitigate these risks and also capitalize on prospective advantageous opportunities that may emerge as a result of climate change. For instance, adapting to longer growing seasons or increased agricultural yields in specific regions. Another, mechanism that can be used is geoengineering. The

³⁵ UNESCO, ‘UNESCO Strategy for Action on Climate Change’ (*Unesco.org*2021) <<https://unesdoc.unesco.org/ark:/48223/pf0000259255.locale=en>> accessed 25 May 2023.

concept of climate engineering is intricately connected to climate change, as it encompasses purposeful and extensive interventions in the Earth’s systems aimed at mitigating or offsetting the impacts of climate change. It encompasses various techniques aimed at manipulating the climate on a global scale. These techniques can be categorized into two broad categories: solar radiation management (SRM) and carbon dioxide removal (CDR). Solar radiation management techniques aim to reflect a portion of the sun’s radiation away from the Earth, thereby reducing global warming. Examples include deploying reflective aerosols in the stratosphere or brightening marine clouds to enhance their reflectivity. Carbon dioxide removal techniques, on the other hand, focus on removing carbon dioxide from the atmosphere to reduce its concentration and mitigate climate change. This can be achieved through various means such as afforestation, ocean fertilization, direct air capture, and enhanced weathering. Therefore, careful evaluation and international cooperation are necessary to assess the feasibility, risks, and ethical implications of adaptation, mitigation and geoengineering approaches in addressing climate change.³⁶

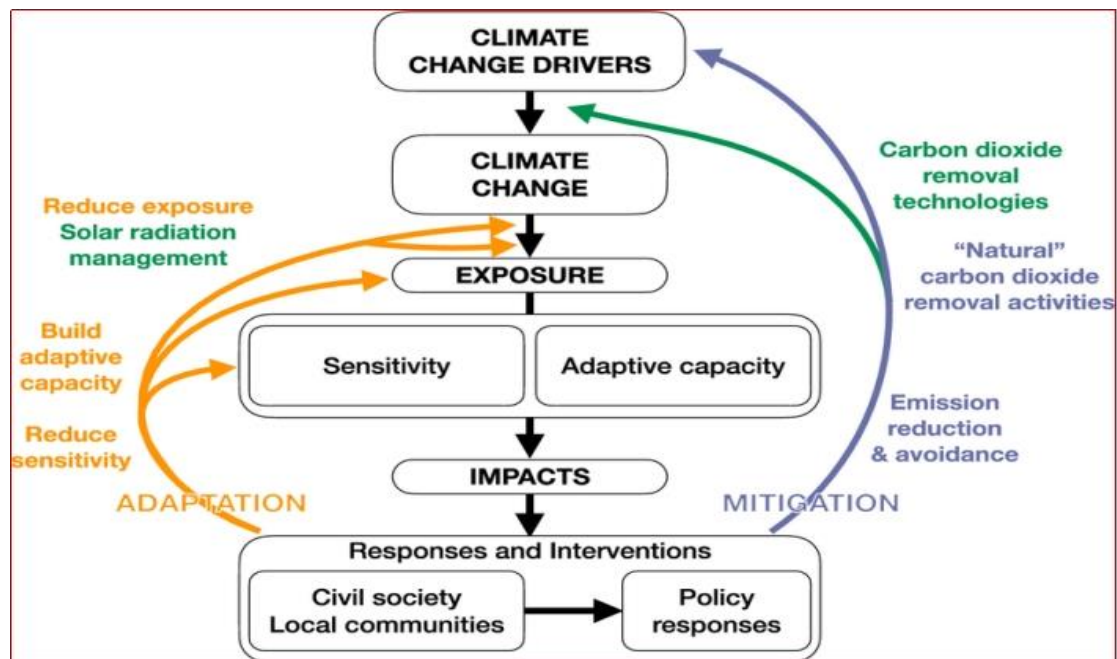


Figure 1. The actions taken to address the impacts of climate change can be classified into two categories: mitigation (represented by the colour blue) and adaptation (represented by the colour gold). Additionally, there are interventions that primarily involve technological solutions, often referred to as “geoengineering” (represented by the colour green).³⁷

³⁶ Zhe Liu and Ying Chen, ‘Impacts, Risks, and Governance of Climate Engineering’ (2015) 6 *Advances in Climate Change Research* 197.

³⁷ Eurostat, ‘Climate Change - Driving Forces’ (*ec.europa.eu* August 2022) <https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Climate_change_-_driving_forces> accessed 7 June 2023.

Taking proactive and coordinated measures to address and respond to climate change will play a crucial role in realizing the vision of a thriving, resilient, secure, sustainably managed, and ecologically diverse ocean, as envisioned by the Sustainable Development Goals (SDGs). This can be depicted in the Figure 1. that impact of climate change can be altered with the climate change drivers i.e., adaptation and mitigation.

2.3 Socio- Economic Implications of Climate Change on Human Rights

“Climate change, human-induced climate change, is obviously an assault on the ecosystem that we all share, but it also has the added feature of undercutting rights, important rights like the right to health, the right to food, to water and sanitation, to adequate housing, and, in a number of small island States and coastal communities, the very right to self-determination and existence.”³⁸

Climate change presents a significant peril to the livelihoods and welfare of people and communities globally. It poses a significant danger to the human rights of our era, representing a grave threat to the basic entitlements of individuals and communities worldwide. The fundamental rights to health, life, food, and a decent standard of living are seriously jeopardized by the implications of the climate. A rights-based approach can be utilized to incorporate human rights into climate change-related initiatives. This approach is in accordance with the Declaration on the Right to Development and the United Nations’ Common Understanding of a Human Rights-Based Approach to Development Cooperation. The UN Common Understanding places significant emphasis on fundamental principles of human rights, including but not limited to indivisibility, universality, interdependence, equality, non-discrimination, accountability, participation, inclusion, and the principle of rule of law. During the past decade, there has been a global consensus on various aspects related to climate change. International organizations and governments have acknowledged the substantial repercussions of climate change on human rights. Nevertheless, there is still a lack of consensus regarding the responsibilities of governments and private entities in addressing this issue. The principal significance of the analysis is to provide the latest review of the ways in which climate change impacts human rights law and to make

³⁸ Flavia Pansieri, United Nations Deputy High Commissioner for Human Rights <<https://www.ohchr.org/Documents/Issues/ClimateChange/COP21.pdf>> accessed 4 June 2023.

recommendations for how to better include a human rights perspective into both global and local climate actions. Furthermore, the report will offer a comprehensive analysis of the impact of climate variability on rights of individuals globally. Adopting a rights-driven framework facilitates the assessment of corresponding obligations, gaps in authority, and potential for harm, as well as the subsequent pursuit of solutions to these problems. It lays the groundwork for strategies, policies, and programmes based on the rights and responsibilities articulated in normative international law.

2.3.1 Impact on Ecosystem and Natural Resources

Based on projections by the Intergovernmental Panel on Climate Change (IPCC), climate change is expected to have a substantial impact on water resources in dry subtropical regions. This will lead to a decrease in both surface water and groundwater availability, resulting in increased competition for water resources among various sectors such as ecosystems, agriculture, industry, settlements, and energy production. Consequently, energy, food security and the regional waters will be affected as a result of these changes.³⁹ Furthermore, modifications in the distribution of rainfall, coupled with rising temperatures and the elevation of sea levels, have the potential to adversely affect freshwater ecosystems through the modification of stream flow patterns and the degradation of water quality. Climate change will have several adverse effects on water resources, including an increased frequency of droughts in currently arid regions. These water shortages and droughts will be driven by various factors, such as reduced rainfall, diminished snow-pack leading to decreased river and stream water supply, higher temperatures causing increased evaporation from surface water and soils, and rising sea levels contributing to the intrusion of saltwater into freshwater sources (Figure 2.) As a result, the potential exists for a decline in the quality and availability of water resources intended for human consumption, agricultural activities, and other essential purposes, posing a risk to these sectors.

Climate change poses a serious threat to the long-term viability of both terrestrial and freshwater ecosystems in intermediate emissions scenarios due to the high probability that it will cause rapid and permanent changes at the regional scale in the ecosystems'

³⁹ IPCC, Climate Change 2022: Mitigation of Climate Change, the Working Group III contribution. (Cambridge University Press 2022).

composition, structure, and functioning. “Forest dieback”⁴⁰ poses a significant environmental risk with far-reaching repercussions for the climate, ecosystems, the quality of the water, the generation of wooden material, and the well-being of individuals. The causes of tree mortality include elevated temperatures, drought conditions, and shifts in insect pests and diseases, which are partly attributed to global warming.⁴¹

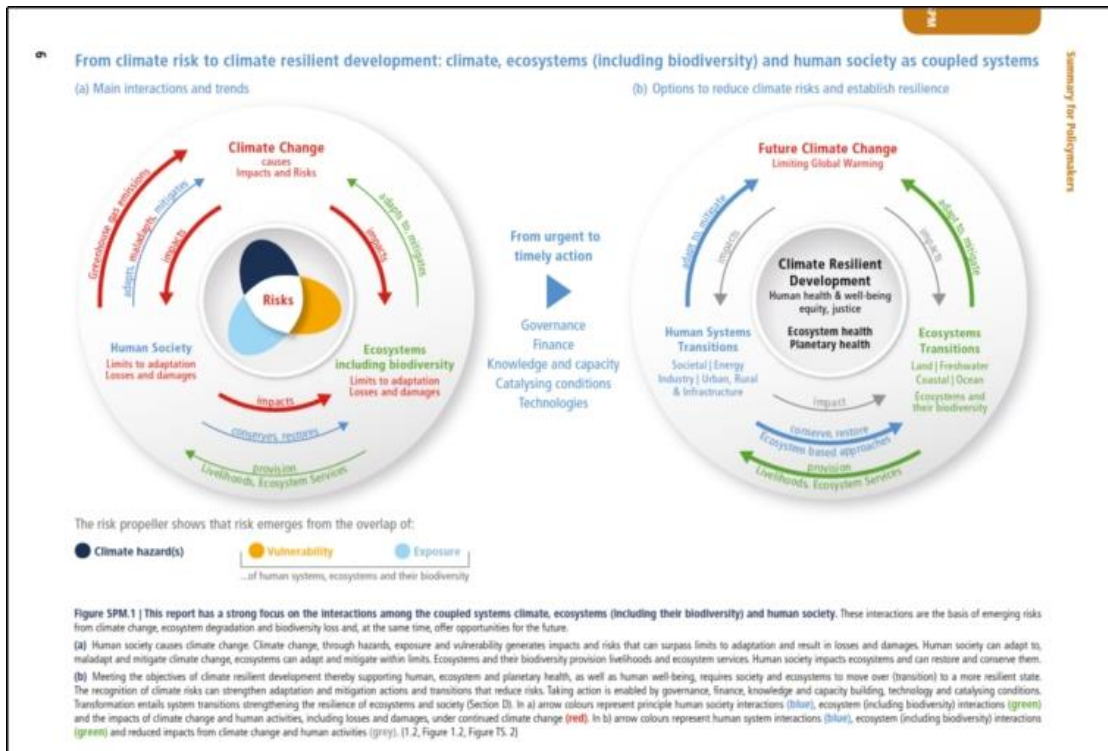


Figure 2. The diagram depicts the relationship and implications of the Climate Change on the ecosystem (including biodiversity) and human society.⁴²

Furthermore, it is anticipated that there will certainly be a rise in the magnitude of tropical cyclones, and this, together with the rise in sea levels and the destruction of protective ecosystems, poses a direct threat to the lives of people and the communities

⁴⁰ Forest dieback refers to the phenomenon where a significant portion of a forest or individual trees within a forest experience widespread decline or death. It is typically caused by various factors such as climate change, drought, insect infestations, diseases, pollution, or a combination of these stressors.

⁴¹ Paulo Eduardo Menezes-Silva and others, ‘Different Ways to Die in a Changing World: Consequences of Climate Change for Tree Species Performance and Survival through an Ecophysiological Perspective’ (2019) 9 Ecology and Evolution 11979 <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6822037/>> accessed 26 May 2023.

⁴² Intergovernmental Panel on Climate Change, ‘AR6 Climate Change 2022: Mitigation of Climate Change— IPCC’ (www.ipcc.ch/2022) <<https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/#:~:text=The%20IPCC%20has%20finalized%20the>> accessed 2 April 2023.

that are located along the coast.⁴³ Climate change is causing significant changes in the ocean's physical, chemical, and biological characteristics. Scientists have observed substantial shifts in the distribution of species and changes in the composition of ecosystems due to the warming of the ocean. For instance, many fish and invertebrate species are moving towards the poles or migrating to deeper, cooler waters. These shifts in species distribution and ecosystem composition are direct consequences of ocean warming caused by climate change.⁴⁴ In addition to this, its consequence on harvest and terrestrial agricultural⁴⁵ output have become inescapable in diverse regions around the world.⁴⁶ Additionally, there is empirical evidence that suggests that food production has been affected by unfavourable weather conditions, such as hurricanes, floods, and storms.⁴⁷ In the future, it is highly probable that climate change will have negative consequences on the cultivation of key crops such as maize, rice, and wheat affecting both tropical and temperate regions. However, it is challenging to attribute these specific events solely to climate change, although it is anticipated that climate change will contribute to an increased likelihood of such occurrences. In the coming years, the potential effects of climate change on global food security could be highly damaging. For instance, in a scenario where global warming reaches 2°C, approximately ten percent of the forecasted effects on food security are expected to occur within the specified timeframe of 2030-2049 which could result in crop yield losses exceeding 25%.⁴⁸ Thus, climate change poses significant threats to a wide range of fundamental human rights, including the right to water and sanitation, health, life, food, an adequate standard of living, housing, property, self-determination, and more. These rights are

⁴³ This Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC) was prepared following an IPCC Panel decision in 2016 to prepare three Special Reports on Climate Change and Oceans and the Cryosphere was made at the Forty-Third Session of the IPCC in Nairobi, Kenya, 11–13 April 2016.

⁴⁴ Scott C Doney and others, 'Climate Change Impacts on Marine Ecosystems' (2012) 4 Annual Review of Marine Science 11 <<https://www.annualreviews.org/doi/10.1146/annurev-marine-041911-111611>> accessed 28 April 2023.

⁴⁵ Terrestrial agriculture refers to the practise of cultivating crops and raising livestock on land, as opposed to other forms.

⁴⁶ Lalit Kumar and others, 'Chapter 4 - Climate Change and Future of Agri-Food Production' (Rajeev Bhat ed, *ScienceDirect* 1 January 2022) 49 <<https://www.sciencedirect.com/science/article/abs/pii/B9780323910019000098>> accessed 6 May 2023.

⁴⁷ Food and Agriculture Organization of the United Nations, 'Climate Change and Food Security: Risks and Responses' (2015) <<https://www.fao.org/3/i5188e/I5188E.pdf>> accessed 17 May 2023.

⁴⁸ IPCC, 'Chapter 5 — Special Report on Climate Change and Land' (*Ipcc.ch2019*) <<https://www.ipcc.ch/srccl/chapter/chapter-5/>> accessed 9 May 2023.

adversely affected as a consequence of climate change's impact, highlighting the urgent need for comprehensive actions to mitigate and adapt to its consequences.⁴⁹

2.3.2 Impact on Human Settlement and Physical Structure

The climate change not only impacts rural areas but also affects urban areas adversely. Climate change-related events, including sea-level rise, storms, heatwaves, heavy rainfall, floods, landslides, droughts, aridity, water scarcity, and air pollution, will significantly affect various aspects of cities, their infrastructure, services, and functions. These phenomena can also amplify existing challenges and stresses.⁵⁰ The risks associated with climate change in urban areas are on the rise, leading to detrimental effects on individuals, their livelihoods, well-being, assets, along with regional and national fiscal system and environment. It will not solely impact water availability, food security, and agricultural incomes in rural regions, but it will also have consequences for human well-being, livelihoods, financial stability, and migration trends. Rural regions are particularly susceptible to the impacts of climate change because of their reliance on agriculture and a variety of natural resources, such as the fishing industry and forests. Furthermore, individuals who are at an increased risk due to preexisting conditions such as poverty, limited access to education, physical isolation, and insufficient attention from policymakers are further subjected to increased susceptibility.⁵¹

The impacts of climate change are likely to become apparent in the future throughout extensive field of economic fields as well as service industries, including tourism, fisheries, agriculture, forestry and insurance, as well as energy, water services, transportation, and transportation (Figure 3.) Sectors and services such as food production systems, water supply systems, and organisations that rely on renewable

⁴⁹ United Nations, 'Support Sustainable Development and Climate Action' (*United Nations*2021) <<https://www.un.org/en/our-work/support-sustainable-development-and-climate-action>> accessed 8 April 2023.

⁵⁰ Clare Goodess and others, 'Changes in Climate Extremes and Their Impacts on the Natural Physical Environment' (Declan Conway 2012) <https://www.ipcc.ch/site/assets/uploads/2018/03/SREX-Chap3_FINAL-1.pdf> accessed 1 June 2023.

⁵¹ Purnamita Dasgupta and others, '9 Rural Areas Coordinating Lead Authors: Lead Authors: Contributing Authors: Review Editors: Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change' (Japan 2018) <https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-Chap9_FINAL.pdf> accessed 29 May 2023.

energy sources to power their manufacturing processes are especially susceptible to the potentially disastrous effects of climate change.⁵² The tourism industry is particularly susceptible to the effects of climate change, while also being a significant contributor to the emission of GHGs, which contribute to global warming.⁵³ Prioritizing swift climate action within the tourism sector is crucial to enhance its resilience. Climate action encompasses a diverse array of endeavours that seek to quantify and mitigate the release of greenhouse gas (GHG) emissions, while also bolstering the sector’s capacity in order to effectively manage the repercussions arising from climate change, it is imperative to develop appropriate strategies and mechanisms. Economic ramifications will also arise as a result of factors such as the implications for human health, limited availability of water resources, and the prevalence of severe weather phenomena.

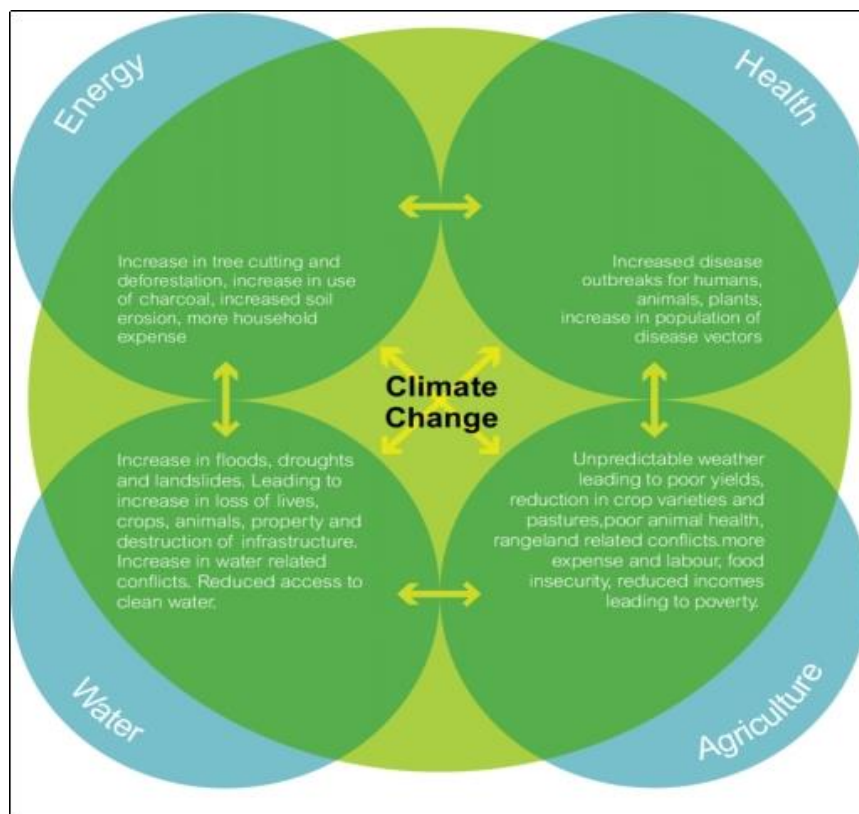


Figure 3. Impacts of Climate Change on Livelihoods⁵⁴

⁵² Food and Agriculture Organization of the UN Rome, ‘CLIMATE CHANGE and FOOD SECURITY: FRAMEWORK DOCUMENT INTERDEPARTMENTAL WORKING GROUP on CLIMATE CHANGE’ (2008) <<https://www.fao.org/3/k2595e/k2595e00.pdf>> accessed 25 April 2023.

⁵³ David Viner and Maureen Agnew, ‘Climate Change and Its Impacts on Tourism Report Prepared for WWF-UK’ (1999) <https://assets.wwf.org.uk/downloads/tourism_and_cc_full.pdf> accessed 28 May 2023.

⁵⁴ Centers for Disease Control and Prevention, ‘CDC - Climate Change and Public Health - Climate Effects on Health’ (cdc.gov 2 March 2021) <<https://www.cdc.gov/climateandhealth/effects/default.htm>> accessed 29 May 2023.

The decline in productivity observed in fisheries, agricultural systems, forests, and other substantial exhaustible resources will lead to substantial economic losses, both in both immediate and long-term terms. The electricity systems will experience impacts from climate change, including both direct effects such as higher temperatures and reduced water supply, as well as increased electricity demand, which collectively can pose challenges to the reliability of the electric grid.⁵⁵ Hence, this makes it feasible to derive the inference that climate change represents a significant risk to fundamental human rights. These core freedoms include the right to life, housing, health, water and sanitation, an appropriate quality of living, property, and food. By addressing climate change and ensuring sustainable measures, we can safeguard these rights and foster a future where every individual's well-being and dignity are protected.

2.3.3 Impact on Health, Security and Livelihood

Scientific evidence supports the notion that climate change has already played a role in exacerbating health issues in certain areas. In the event that climate change persists according to various projected scenarios, substantial health consequences are expected to arise, including heightened vulnerability to injuries, diseases, and fatalities due to more severe heatwaves and fires. Additionally, there will be an increased risk of under-nutrition in impoverished regions as food production diminishes. The health consequences will extend to reduced work capacity and labour productivity among vulnerable populations, along with an elevated risk of diseases transmitted through food, water, and vectors.⁵⁶ The risks associated with climate change, which encompass both gradual changes and extreme weather events, will have a direct impact on people's livelihoods. The aforementioned impacts encompass outcomes such as reduced agricultural productivity, the exhaustion of assets, the devastation of residential structures and properties, and the forced relocation of communities. Additionally, by exacerbating existing stressors, these hazards will indirectly impact livelihoods. For instance, the phenomenon of global warming has the potential to contribute to the upward trajectory of prices in the domains of food and energy, thereby intensifying the

⁵⁵ World Meteorological Organization, 'Climate Change Puts Energy Security at Risk' (*public.wmo.int*10 October 2022) <<https://public.wmo.int/en/media/press-release/climate-change-puts-energy-security-risk>> accessed 18 May 2023.

⁵⁶ JP Majra and A Gur, 'Climate Change and Health: Why Should India Be Concerned?' (2009) 13 *Indian Journal of Occupational and Environmental Medicine* 11 <<https://www.ncbi.nlm.nih.gov/pubmed/20165606>> accessed 23 May 2023.

challenges faced by individuals and communities, instabilities in politics and widespread conflicts, and disturbances at the individual and household levels.⁵⁷ Hence, this constitutes in one of the multiple considerations that can perpetuate a detrimental cycle of poverty, inequality and deprivation.⁵⁸ Furthermore, the shortage of vital resources, such as water, food, land, and other natural resources, will worsen as a consequence of changes in the climate. by climate change, posing a threat to human security.⁵⁹

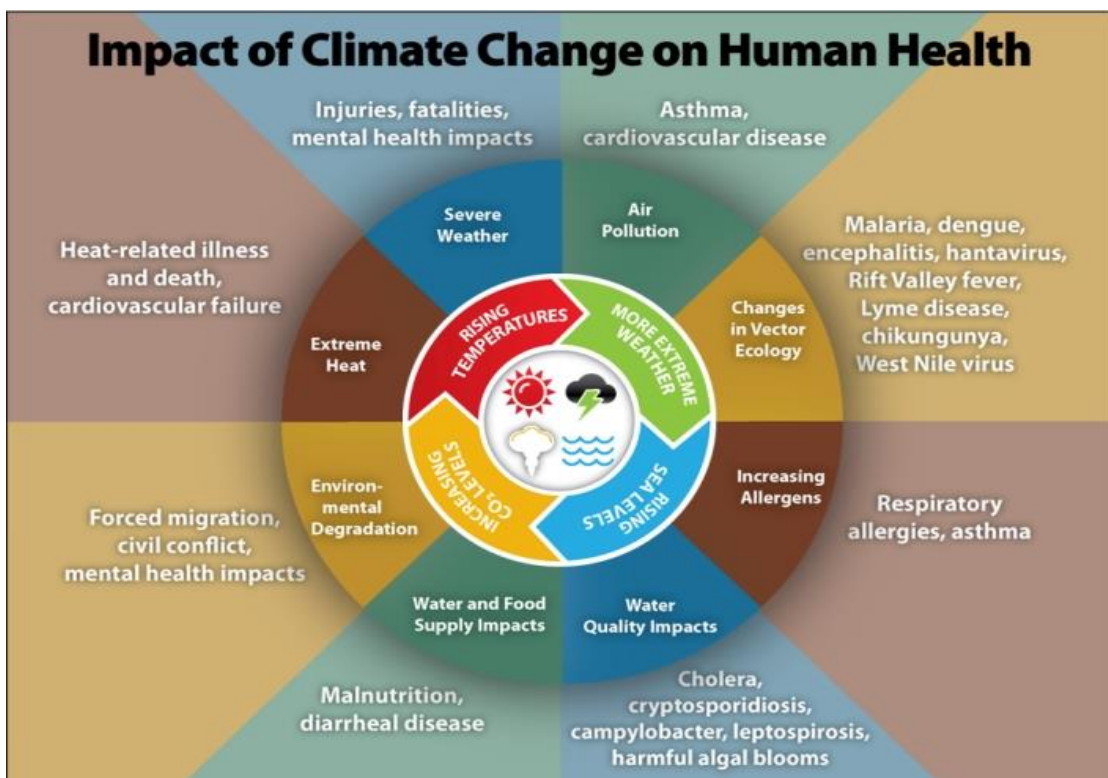


Figure 4. Climate change has a broad range of effects on various health outcomes. This diagram presents the major impacts of climate change, including higher temperatures, extreme weather events, rising sea levels, and increased carbon dioxide levels. These impacts influence different exposures, which in turn can lead to various health outcomes.⁶⁰

This threat encompasses various aspects such as the stability of livelihoods, preservation of cultural identity, include migration and displacement structures, as well

⁵⁷ WORLD SOCIAL REPOR, ‘Climate Change: Exacerbating Poverty and Inequality in a Rapidly Changing World’ (2020) <<https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/02/World-Social-Report-2020-Chapter-3.pdf>> accessed 13 May 2023.

⁵⁸ S Nazrul Islam and John Winkel, ‘Climate Change and Social Inequality’ (2017) <https://www.un.org/esa/desa/papers/2017/wp152_2017.pdf> accessed 1 June 2023.

⁵⁹ In the IPCC report AR5, “human security” is defined as “a condition that exists when the vital core of human lives is protected, and when people have the freedom and capacity to leave with dignity.”

⁶⁰ Centers for Disease Control and Prevention, ‘CDC - Climate Change and Public Health - Climate Effects on Health’ (*cdc.gov* 2 March 2021) <<https://www.cdc.gov/climateandhealth/effects/default.htm>> accessed 29 May 2023.

as the capacity of nation-states to establish and maintain the requisite conditions to safeguard the well-being and safety of individuals. The phenomenon of climate change is anticipated to trigger heightened migration patterns, specifically among island communities who will face the repercussions of rising sea levels, coastal erosion, saltwater intrusion, and more frequent and severe droughts.⁶¹ These adverse effects of climate change on islands will lead to increased movement of people seeking alternative living conditions. These impacts not only directly impact human security but also have the potential to contribute to political instability and armed conflict.⁶² Thus, from the above discussion and research, it can be deduced that climate change represents a substantial peril to a range of fundamental rights, including the right to an adequate standard of living, health, life, property, nationality, mobility, self-determination and more. As climate change continues to impact our world, these rights are at risk, highlighting the urgent need for comprehensive actions to mitigate and adapt to its effects, ensuring the protection and fulfilment of these essential human rights.

2.4 Conclusion

To conclude, the socio- economic implications vary from various factors and have different impacts on the lives of individuals, groups or society. It can be observed that these impacts can be positive as well as negative and they can appear in various forms, influenced by the particular circumstances at hand. The researcher has discussed array of instances in the research by incorporating the issues such as human health, security, lifestyle, effect on the livelihood, settlement. The climate change has not only limited to impact human rights of the individuals but also, adversely impacted the ecosystem and natural resources. Climate change has directly or indirectly impacted the increase of poverty, migration situations, social mobility and political stability of the individuals as well. Therefore, in order to mitigate the climate change situation, every nation must adopt dual approach in its practice i.e., decrease in the emission of the GHGs in the

⁶¹ IPCC, 'Migration and Climate Change' (2021) <https://www.ipcc.ch/apps/nj-lite/srex/nj-lite_download.php?id=5866> accessed 2 June 2023.

⁶² For instance, in a report on Syria, the former Special Rapporteur on the Right to Food described how severe droughts, exacerbated by climactic changes in the region, led to crop failures and food shortages, thus undermining the right to food. Olivier De Schutter, Special Rapporteur on the Right to Food, Addendum, Mission to the Syrian Arab Republic, U.N. Doc. A/HRC/16/49/Add. (Jan. 27, 2011). Since then, the drought and food shortages have contributed to political instability and violent conflict, resulting in deaths, injuries and displacement of millions of people. See also U.N. Secretary-General, Climate change and its possible security implications: Report of the Secretary-General, UN Doc. A/64/350 (Sept. 11, 2009).

atmosphere and it is vital to adjust and respond to the current and anticipated consequences of climate change in form of strategies and projects. So, in order to effectively examine and tackle these implications, it is essential to possess a thorough comprehension of the wider dynamics within society and the possible outcomes of particular policies or events.

Chapter- 3

Evolution of International Framework on Renewable Energy

3.1 What is Renewable Energy?

The term “energy” is derived from Greek word *en-ergon* meaning work content or “at work.”⁶³ Energy generation is a dynamic and intricate process that encompasses the conversion of one form of energy into another usable form i.e., it involves the transformation of one form of energy into another. This complex phenomenon involves various mechanisms, such as mechanical, thermal, chemical, or electromagnetic transformations, which harness the inherent potential of different energy sources. Through these conversions, energy can be harnessed, stored, and utilized to power our everyday lives, facilitate industrial processes, and fuel technological advancements, thereby driving progress and sustainability in our modern society. There is a distinction between energy, force and power because energy needs a carrier, for instance gasoline, electricity, batteries and hydrogen etc. There are different forms of energy such as thermal, kinetic, nuclear, chemical, electrical, gravitational. Furthermore, there are different sources of energy generation such as renewable (non-conventional) and non-renewable (conventional) sources of energy. The distinction between renewable and non-renewable energy sources is predicated upon their respective characteristics pertaining to accessibility and capacity for replenishment over a given period. Renewable energy sources refer to those that possess the inherent ability to be replenished naturally or are characterised by a virtually limitless supply. These sources, such as solar, wind, hydro, geothermal, and biomass energy, derive their power from ongoing natural processes or cycles that continuously generate energy. They are recognized as sustainable solutions because their use does not jeopardize their supply for future generations to inherit. However, non- RES are finite and take millions of years to form. These sources, including fossil fuels like coal, oil, and natural gas, as well as nuclear energy, are derived from ancient organic matter or radioactive materials that exist in limited quantities. Once these resources are depleted, they cannot be readily replenished within a human lifetime. Non-renewable energy sources are subject to

⁶³ Jennifer Coopersmith, ‘Energy’ (*Eoht.info*2023) <<http://www.eoht.info/page/Energy>> accessed 14 June 2023.

depletion, and their extraction and utilization often have significant environmental impacts, including greenhouse gas emissions and air pollution. To summarize, the primary differentiation between these two energy sources resides in their capacity to naturally replenish and endure in an environmentally sustainable manner. Renewable sources have an ongoing supply, while non-renewable sources are finite and deplete over time. The differentiation described carries substantial significance when considering the enduring sustainability and ecological ramifications of energy generation.

In more simple terms, the renewable energy can be defined as, “energy that is obtained from sources that are for all practical purposes inexhaustible, which includes moving water (hydroelectric power, tidal power, and wave power), thermal gradients in ocean water, biomass, geothermal energy, solar energy, and wind energy. Contrast this with energy from sources such as fossil fuels, of which there is a finite supply which is exhaustible; also known as renewable.”⁶⁴ It is clear in the preamble of Statute of the International Renewable Energy Agency (IRENA) the intention, motive and underlying principles are highlighted to provide coherence, clarity, direction and significance of globally promoting and encouraging the widespread adoption of renewable energy.⁶⁵ Its key objectives include facilitating collaboration among member countries, advancing renewable energy technologies and innovation, supporting policy development and implementation, promoting the socioeconomic benefits of RE, and enhancing energy access as well as feature of security. By bringing together governments, policymakers, and industry leaders, IRENA aims to accelerate the development, deployment, and cost-effectiveness of RE solutions while fostering sustainable economic growth, creating employment opportunities, and expanding energy access. Acknowledging the significance of utilizing RE in fulfil the goals of SD, guaranteeing energy security, as well as mitigating climate change, there is a strong desire to promote its widespread adoption. The motive is to harness the vast

⁶⁴ Meaning of Renewable Energy, Oxford Advanced Learners Dictionary (10th edn,2020) <<http://www.oxforddictionaries.com/definition/english/refugee>> accessed 14 April 2023.

⁶⁵ International Renewable Energy Agency, ‘CONFERENCE on the ESTABLISHMENT of the INTERNATIONAL RENEWABLE ENERGY AGENCY Statute of IRENA Signed in Bonn’ (2009) <https://www.irena.org/-/media/Files/IRENA/Agency/About-IRENA/Statute/IRENA_FC_Statute_signed_in_Bonn_26_01_2009_incl_declaration_on_further_authentic_versions.pdf?la=en&hash=635C494208DD405EA8CD2BDB04414FECD40F55F1> accessed 26 April 2023.

opportunities offered by renewable energy to tackle issues related to volatile energy prices, reduce GHGs, stabilize the climate, and transition to a low carbon economy. Additionally, providing decentralized energy access, especially in developing countries and remote regions, is emphasized. Furthermore, the need to mitigate the health implications associated with fossil fuel use and inefficient traditional biomass utilization is acknowledged. It is firmly believed that renewable energy, combined with improved energy efficiency, can meet the growing global energy demand expected in the coming decades. To facilitate international cooperation and collaboration, there is an affirmation to establish an international organization dedicated to renewable energy, which would work closely with existing organizations focused on promoting RE.

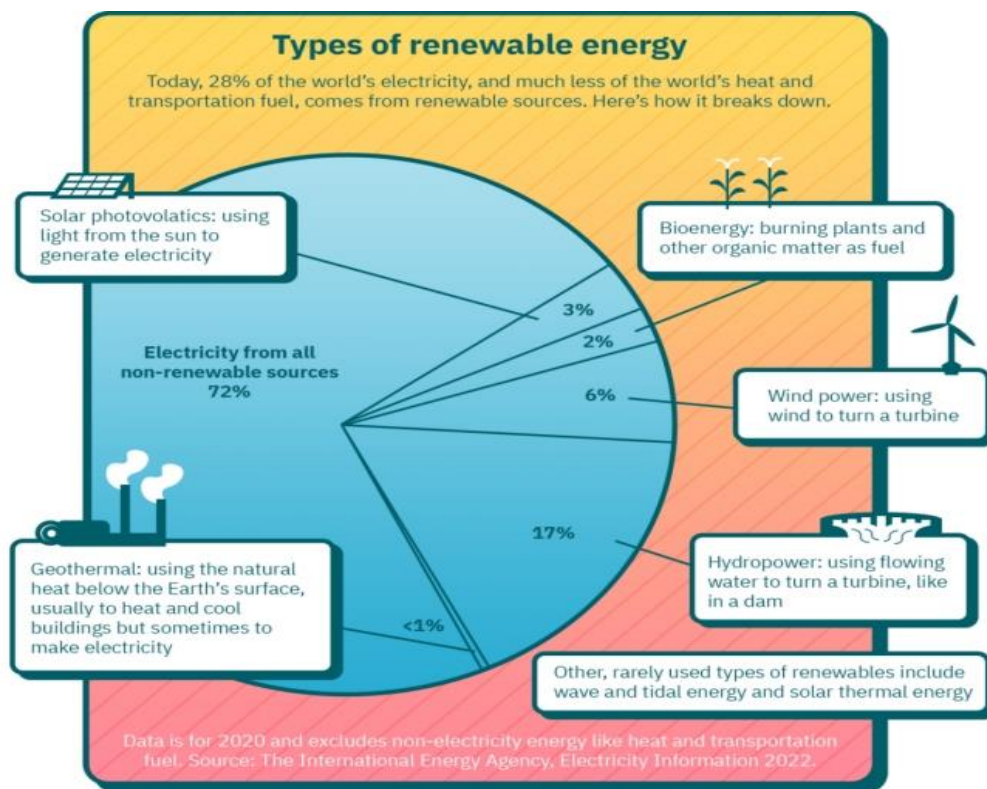


Figure 5. Types of Renewable Energy

The legislation specifies the components of energy from renewable sources as, “all forms of energy produced from renewable sources in a sustainable manner, which include, inter alia: bioenergy; geothermal energy; hydropower; ocean energy, including inter alia tidal, wave and ocean thermal energy; solar energy; and wind energy.” (Figure 5)⁶⁶ According to Directive 2009/28/EC of the European Commission on the Promotion

⁶⁶ Article III of the Statute of the International Renewable Energy Agency (IRENA), ‘CONFERENCE on the ESTABLISHMENT of the INTERNATIONAL RENEWABLE ENERGY AGENCY Statute of

of the Utilisation of Energy Generated from RES, “energy from renewable sources means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and bio-gases.”⁶⁷ Regulating the meaning and the scope of the term renewable energy is crucial for multiple reasons. It guarantees consistency and clarity in identifying energy sources that meet the renewable criteria, enabling accurate assessment and comparison. Furthermore, it prevents deceptive practices and ensures transparency in the renewable energy sector. In addition, the establishment of a standardised definition serves as a framework for shaping policies and making informed decisions, in doing so, it fosters the progression of sustainable energy technologies and facilitates the transition towards environmentally conscious energy systems, thereby contributing to the global endeavour to mitigate climate change. Renewable energy holds immense significance in today’s energy mix for several key reasons.⁶⁸ Firstly, it provides a sustainable and abundant energy supply, as renewable sources can be naturally replenished indefinitely. This reduces reliance on finite and environmentally damaging resources. Secondly, renewable energy enhances energy diversification and independence, reducing dependence on imported fossil fuels and increasing energy security. It promotes self-sufficiency by utilizing local resources. Thirdly, it plays a crucial role in mitigating climate change by producing minimal to no greenhouse gas emissions. This makes it a vital tool in addressing global warming and achieving carbon neutrality goals. Moreover, renewable energy brings economic benefits by driving job creation, economic growth, and investment opportunities. It stimulates local economies and fosters technological advancements. Furthermore, renewable energy offers decentralized energy solutions, providing access to remote areas and improving livelihoods for underserved communities. Lastly, renewable energy improves public health and contributes to environmental preservation by reducing pollution and creating

IRENA Signed in Bonn’ (2009) <https://www.irena.org/-/media/Files/IRENA/Agency/About-IRENA/Statute/IRENA_FC_Statute_signed_in_Bonn_26_01_2009_incl_declaration_on_further_authentic_versions.pdf?la=en&hash=635C494208DD405EA8CD2BDB04414FECD40F55F1> accessed 26 April 2023.

⁶⁷ European Environment Agency, ‘DIRECTIVE 2009/28/EC— European Environment Agency’ (www.eea.europa.eu/April 2009) <<https://www.eea.europa.eu/policy-documents/2009-28-ec#:~:text=The%20Directive%202009%2F28%2FEC>> accessed 13 May 2023.

⁶⁸ International Energy Agency, ‘Renewable Power’s Growth Is Being Turbocharged as Countries Seek to Strengthen Energy Security - News’ (IEA6 December 2022) <<https://www.iea.org/news/renewable-power-s-growth-is-being-turbocharged-as-countries-seek-to-strengthen-energy-security>> accessed 21 April 2023.

a cleaner and healthier environment. In summary, its importance lies in its ability to provide a sustainable, climate-friendly, and secure energy supply, mitigate climate change, enhance energy independence, stimulate economic growth, provide energy access, and promote public health and environmental well-being. Embracing renewable energy is essential for a resilient and sustainable energy future.

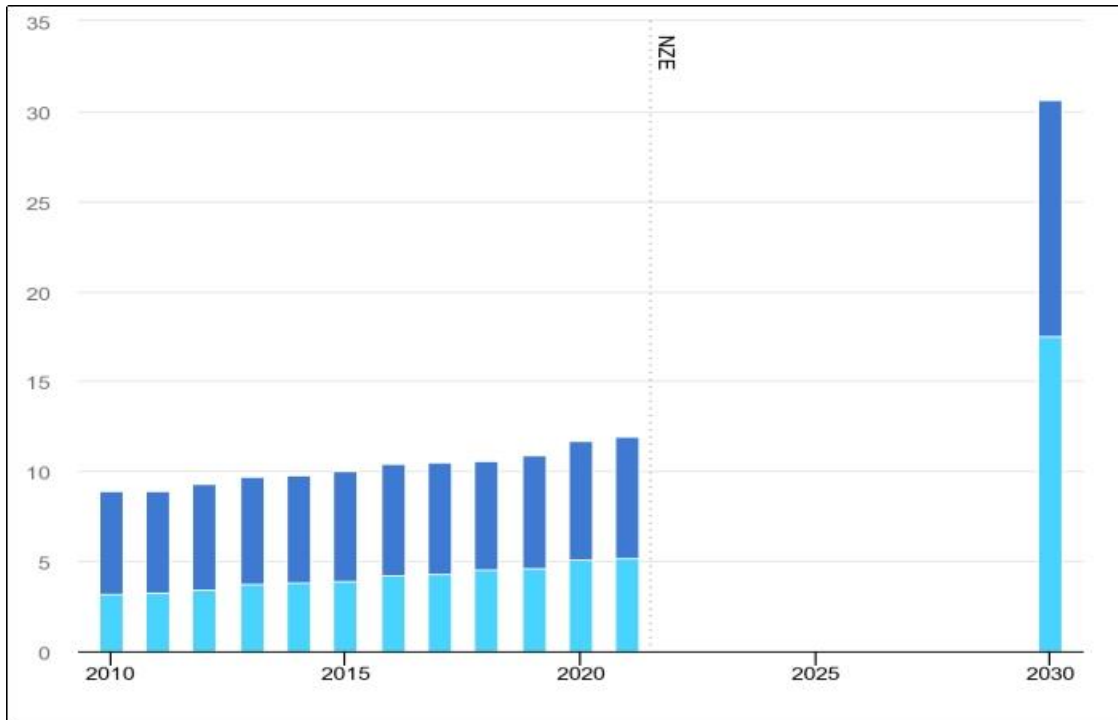


Figure 6. The graph shows the renewable share of energy in the Net Zero Scenario, 2010-2030. NZE stands for Net Zero Emission scenario. Here:

- Shows solar, hydro, wind, geothermal and ocean energy
- Shows Modern Bioenergy

Renewable energy (RE) sources have a crucial part to play in facilitating the transition towards clean energy. They have been accountable for more than 30% of the reduction in CO2 emissions projected from 2020 to 2030, as per the Net Zero Emissions by 2050 Scenario.⁶⁹ In order to attain Net Zero Revenue in 2050, there is a requirement for an average annual growth rate of approximately 13% in renewable energy usage from 2022 to 2030, which is twice the rate observed from 2019 to 2021.⁷⁰ (Figure 6.)

⁶⁹ Piotr Bojek, ‘Renewables– Analysis’ (*International Energy Agency* September 2022) <<https://www.iea.org/reports/renewables>> accessed 3 June 2023.

⁷⁰ International Energy Agency, ‘Net Zero by 2050– Analysis’ (*IEA* May 2021) <<https://www.iea.org/reports/net-zero-by-2050>> accessed 15 April 2023.

Between 2020 and 2030, wind and solar technologies, in particular, make a significant contribution to global reductions in CO₂ emissions, representing a substantial portion of the overall decline.⁷¹ The RE supply from geothermal, solar, hydro, wind, and ocean sources witnessed an increase of nearly 7% in the year 2021.⁷²

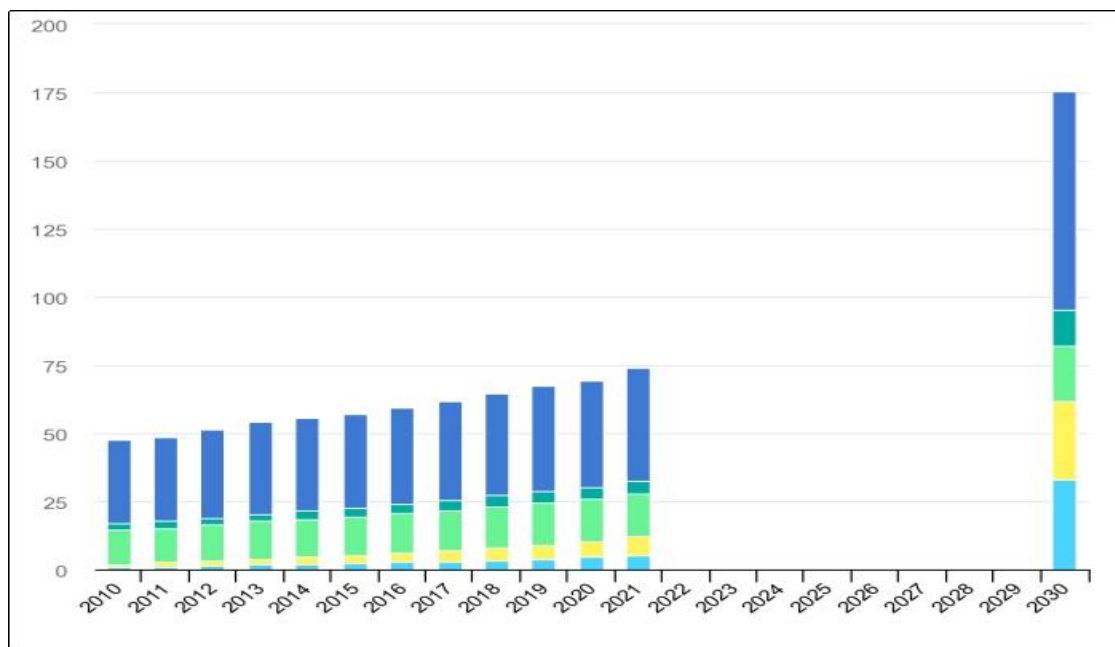


Figure 7. The Renewable energy supply by technology in the Net Zero Scenario, 2010-2030.⁷³ Here:

● Solar ● Wind ● Hydro ● Geothermal/Ocean ● Modern Bioenergy

It is estimated that the generation of electricity from renewable sources is responsible for around forty percent of the entire supply of RE.⁷⁴ In the realm of non-bioenergy (non-renewable) sources, the percentage of generated electricity can reach a notable 80%, with the remaining fraction being allocated to the production of heat via solar and geothermal constructions. Nonetheless, the expansion of geothermal, concentrated

⁷¹ Intergovernmental Panel on Climate Change, 'The Evidence Is Clear: The Time for Action Is Now. We Can Halve Emissions by 2030— IPCC' (IPCC4 April 2022) <<https://www.ipcc.ch/2022/04/04/ipcc-ar6-wgiii-pressrelease/>> accessed 22 May 2023.

⁷² International Energy Agency, 'Renewables 2021' (2021) <<https://iea.blob.core.windows.net/assets/5ae32253-7409-4f9a-a91d-1493ffb9777a/Renewables2021-Analysisandforecastto2026.pdf>> accessed 30 April 2023.

⁷³ International Energy Agency, 'Renewable Energy Supply by Technology in the Net Zero Scenario, 2010-2030— Charts— Data & Statistics' (IEA2022) <<https://www.iea.org/data-and-statistics/charts/renewable-energy-supply-by-technology-in-the-net-zero-scenario-2010-2030>> accessed 1 June 2023.

⁷⁴ Center for Climate and Energy Solutions, 'Renewable Energy | Center for Climate and Energy Solutions' (Center for Climate and Energy Solutions November 2017) <<https://www.c2es.org/content/renewable-energy/>> accessed 19 May 2023.

solar power (CSP), and ocean technologies for electricity and heat generation experienced a lack of progress in 2021, primarily attributed to restricted capacity extensions. Solar photovoltaic (PV) technology has experienced the highest growth in capacity additions in recent years.

Even though with a record-breaking addition of 150 GW in 2021, it accounts for only one-third of the average annual additions required from 2022 to 2030 under the Net Zero Scenario. In the context of wind power, there is a need for a nearly twofold increase in annual installations compared to the levels observed in 2021. Likewise, in the case of hydropower and bioenergy, it is imperative to achieve a growth rate that is approximately twice the mean of the preceding five-year period. In order to align mainstream technologies with the trajectory set by the Net Zero Scenario, it is imperative to undertake substantial endeavours. (Figure 6) Additionally, concentrated solar power (CSP), ocean power and geothermal and still have a long way to go before reaching the growth rates required to meet the scenario's milestones. Thus, it can be concluded from the above graph that the RES have a substantial character in clean energy emissions as these typically emit fewer GHGs, such as carbon dioxide (CO₂), as well as have no emissions at all during their operational phase.⁷⁵ As a result, they contribute to a decrease in overall carbon dioxide and other greenhouse gas emissions.

3.2 Genesis of International Regulation on Renewable Energy

3.2.1 UN Conference on Human Environment, 1972⁷⁶

The inaugural global conference on the environment, known as the Human Environment Conference, was held in Stockholm from June 5th to June 16th, 1972.⁷⁷ With the participation of over 107 countries, it marked the first international gathering to prioritize environmental concerns. This conference served as a platform to acknowledge the global threat to the environment and emphasized the necessity for governments to take effective actions in addressing environmental issues. The Stockholm Conference on the Human Environment stands out as a momentous

⁷⁵ Jennifer Morris, 'Renewable Energy' (*MIT Climate Portal* 3 September 2020) <<https://climate.mit.edu/explainers/renewable-energy>> accessed 1 June 2023.

⁷⁶ Adopted by the United Nations Conference on the Human Environment, Stockholm, 16 June 1972 by U.N. General Assembly Resolutions 2994/XXVII, 2995/XXII and 2996/XXII of 15 December 1972.

⁷⁷ Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992 (United Nations publication, Sales No. E.93.I.8 and corrigenda).

international gathering dedicated to safeguarding the environment. It emphasized the significance of sustainable development, environmental preservation, and international collaboration in tackling environmental issues.⁷⁸ This landmark convention played a pivotal role in raising global awareness and initiating concerted efforts to address environmental concerns. The conference produced an action plan encompassing various areas, including natural resources, human settlements, human health, ecosystems, development, oceans, energy, wildlife, natural disasters, transboundary pollution, nuclear energy, and the need for international laws concerning compensation for pollution and environmental damage victims.⁷⁹ The Action Plan consisted of three primary categories: a) a comprehensive Global Environmental Assessment Programme, also known as the watch plan; b) activities related to environmental management; and c) international measures aimed at supporting assessment and management initiatives on the domestic as well as the international level. Moreover, these categories were further divided into 109 specific recommendations. The UN Conference on the Human Environment is the inaugural global document that addresses fundamental principles for the governance of natural resources, environment, energy, and the promotion of sustainable development. The Stockholm Conference on the Human Environment had a pivotal part in the event “in underscoring the significance of renewable energy within the context of sustainable development.”⁸⁰

By acknowledging the urgency of environmental concerns, the conference emphasized the potential of RES in mitigating climate change and reducing pollution. This event served as a catalyst for enhanced international collaboration and initiatives aimed at promoting the adoption and advancement of renewable energy technologies. The outcomes of the conference, including the establishment of the United Nations Environment Programme (UNEP), helped to raise global awareness and prioritize renewable energy as a pivotal component in achieving a more sustainable and environmentally conscious energy landscape. The mandate of UNEP is to inspire, illuminate and empower countries and individuals to improve their standard of life without jeopardizing that of future generations in order to give leadership and promote

⁷⁸ Günther Handl, ‘Declaration of the United Nations Conference on the Human Environment - Main Page’ (legal.un.orgMay 2012) <<https://legal.un.org/avl/ha/dunche/dunche.html#:~:text=48%2FPC%2F17>> accessed 1 June 2023.

⁷⁹ Satish C. Shastri, *Environmental Law* (7th edn., Eastern Book Company 2022) 412 412.

⁸⁰ *Ibid.*

collaboration in environmental protection. The UNEP is entrusted with the responsibility of offering guidance, conducting scientific research, and devising strategies to tackle various global concerns, such as climate change, the preservation of marine and terrestrial ecosystems, and the promotion of sustainable economic growth.⁸¹ It takes on the role of coordinating the United Nations' efforts in addressing environmental challenges.

Apart from this, the UNGA Res 36/193, commonly referred to as the United Nations Conference on New and Renewable Sources of Energy, is a notable gathering that addresses and advocates for the adoption of innovative and sustainable energy sources. The United Nations Conference on New and Renewable Sources of Energy, GA Res 36/193, holds immense significance in the advancement of renewable energy.⁸² This conference acts as a crucial platform for international discussions and initiatives aimed at promoting the development and utilization of innovative and sustainable energy sources. By bringing together policymakers, scientists, industry leaders, and other stakeholders, the conference facilitates the exchange of knowledge, best practices, and collaborative efforts to accelerate the transition towards a more sustainable energy future. It raises awareness about the crucial role of renewable energy in mitigating climate change, reducing greenhouse gas emissions, and ensuring energy security. Additionally, the conference promotes the establishment of renewable energy targets, supportive policies, and investments in research and development to drive technological innovation. It also fosters international cooperation, enabling partnerships for capacity building, technology transfer and financial support, particularly in developing countries. In summary, the United Nations Conference on New and Renewable Sources of Energy plays a crucial and central role in facilitating and promoting international efforts and cooperation within the realm of renewable energy.⁸³ It shapes the evolution and widespread adoption of sustainable energy

⁸¹ United Nations, 'Support Sustainable Development and Climate Action' (*United Nations*2021) <<https://www.un.org/en/our-work/support-sustainable-development-and-climate-action>> accessed 8 April 2023.

⁸² UN General Assembly (36th Sess.: 1981-1982), 'United Nations Conference on New and Renewable Sources of Energy.' [1982] digitalibrary.un.org <<https://digitalibrary.un.org/record/28741?ln=en>> accessed 11 May 2023.

⁸³ Intergovernmental Panel on Climate Change, 'AR6 Climate Change 2022: Mitigation of Climate Change— IPCC' (*www.ipcc.ch/2022*) <<https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/#:~:text=The%20IPCC%20has%20finalized%20the>> accessed 2 April 2023.

sources, ensuring a more sustainable and environmentally friendly energy landscape worldwide.⁸⁴

3.2.2 World Charter for Nature 1982⁸⁵

The World Charter for Nature, established in 1982, does not explicitly mention renewable energy but its underlying ethos resonates with the encouragement of the use of renewable sources of energy with the goal of achieving environmental sustainability and foster sustainable development, various strategies can be employed. Nevertheless, the fundamental tenets of this ideology prioritise the significance of conserving and protecting the natural environment and its finite resources for the well-being of both current and future cohorts.⁸⁶ The charter's focus on ecological processes, ecosystem protection, and sustainable resource management aligns with the objectives of renewable energy, which aim to minimize environmental impact and reduce dependence on finite fossil fuels.⁸⁷ Promoting renewable energy can be seen as an embodiment of the principles outlined in the World Charter for Nature, as it contributes to sustainable development, biodiversity conservation, and long-term environmental considerations. Article 10 of the World Charter for Nature highlights the importance of managing renewable and non-renewable resources to prevent wastage, irrespective of their nature. The concept of "wise use" applies to both developed and developing countries, emphasizing responsible resource utilization. According to Article 10 (d) of the Charter "Non-renewable resources which are consumed as they are used shall be exploited with restraint, taking into account their abundance, the rational possibilities of converting them for consumption, and the compatibility of their exploitation with the functioning of natural systems." India asserted that Article 11 which contemplates that the utilization of the most advanced technologies that effectively mitigate risks to nature and prevent any adverse impacts should be prioritized, is impractical in the

⁸⁴ Wadim Strielkowski and others, 'Renewable Energy in the Sustainable Development of Electrical Power Sector: A Review' (2021) 14 *Energies* 8240 <<https://www.mdpi.com/1996-1073/14/24/8240>> accessed 27 March 2023.

⁸⁵ Adopted by the General Assembly in its *Resolution 37/7* of 10 October 1982.

⁸⁶ Alice Venn, 'Social Justice and Climate Change' (2019) 7 *Managing Global Warming* 711 <<https://doi.org/10.1016/B978-0-12-814104-5.00024-7>> accessed 2 June 2023.

⁸⁷ United Nations, 'World Charter for Nature - A/RES/37/7 Annex - UN Documents: Gathering a Body of Global Agreements' (www.un-documents.net1982) <<http://www.un-documents.net/wcn.htm>> accessed 18 March 2023.

developing countries due to their limited industrial and technological capacity, they may not possess the necessary capability.⁸⁸

3.2.3 World Commission on Environment and Development; Brundtland Report 1987⁸⁹

The Brundtland Report, also known as Our Common Future, is a publication issued in 1987 by the World Commission on Environment and Development (WCED). This report introduced the notion of sustainable development and outlined strategies for its attainment. It emphasized, “the necessity of development which meets the needs of present generations without compromising the ability of future generations to meet their needs.” It consisted of chapters that “explored various aspects of sustainable development, including the involvement of the global economy, population dynamics and human resources, ensuring food security, preservation of species and ecosystems, energy considerations, industrial practices, and recommended legal principles for safeguarding the environment.”⁹⁰ The Brundtland Report is frequently acknowledged for its articulation of SD as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”⁹¹ The definition has been broadened to encompass all dimensions pertaining to climate change, while emphasising the significance and preservation of the ecology with the use of renewable form of energy in the report. The report encompassed a variety of chapters that investigated the viability of alternative forms of energy and the efficiency of energy use, in addition to a wide range of strategies designed to reduce energy use.⁹²

⁸⁸ K Wood and Harold W, ‘The United Nations World Charter for Nature: The Developing Nations’ Initiative to Establish Protections for the Environment’ (1985) 12 Ecology Law Quarterly 977 <<https://www.jstor.org/stable/i24109706>> accessed 14 May 2023.

⁸⁹ Adopted by the UN General Assembly, in its resolution 38/161 of 19 December 1983.

⁹⁰ *Ibid.*

⁹¹ Gro Harlem Brundtland, ‘Report of the World Commission on Environment and Development: Our Common Future towards Sustainable Development 2. Part II. Common Challenges Population and Human Resources 4’ (United Nations 1987) <<https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>> accessed 3 June 2023.

⁹² Chapter V, VI, VII, ‘Report of the World Commission on Environment and Development: Our Common Future towards Sustainable Development 2. Part II. Common Challenges Population and Human Resources 4’ (United Nations 1987) <<https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>> accessed 5 June 2023.

3.2.4 United Nations Conference on Environment and Development (UNCED), 1992: AGENDA 21

The United Nations Conference on Environment and Development (UNCED), widely referred to as the Earth Summit, was held in Rio de Janeiro in 1992. It addressed the topic of renewable energy among other global environmental issues. The conference brought together world leaders, diplomats, and representatives from various organizations to discuss sustainable development. The primary objective of the Rio ‘Earth Summit’ was to “establish a comprehensive agenda and a new framework for global endeavours pertaining to environmental and developmental issues.”⁹³ The objective of this initiative was to offer direction for the formulation of international collaboration and development policies in the contemporary era. It determined that achieving sustainable development was an attainable objective for people worldwide, regardless of their local, national, regional, or international contexts. It acknowledged the importance of integrating and balancing economic, social, and environmental considerations to sustain human life on Earth and emphasized the feasibility of adopting an integrated approach. The conference also acknowledged that incorporating economic, social, and environmental dimensions necessitated a shift in our perspectives on production, consumption, lifestyle, work, and decision-making. This groundbreaking notion sparked significant discussions and debates among governmental entities and the interactions between governments and their respective population regarding strategies to achieve sustainable development. Therefore, it can be concluded while the Earth Summit covered various environmental issues, it also addressed the importance of renewable energy as a key component of SD and efforts to combat climate change. The conference contributed to elevating the global significance of renewable energy and laid the groundwork for subsequent initiatives and agreements focused on renewable energy and sustainability.

Moreover, the Earth Summit led to the establishment of the United Nations Framework Convention on Climate Change (UNFCCC).⁹⁴ The UNFCCC aimed to stabilize greenhouse gas concentrations and prevent dangerous climate interference. The

⁹³ United Nations, ‘United Nations Conference on Environment and Development, Rio de Janeiro, Brazil, 3-14 June 1992’ (*United Nations*2022) <<https://www.un.org/en/conferences/environment/rio1992>> accessed 6 June 2023.

⁹⁴ Adopted by UN General Assembly resolution 44/206 of 22 December 1992.

incorporation of renewable energy sources into the discourse and talks surrounding potential responses to climate change has been of critical importance. The United Nations Framework Convention on Climate Change (UNFCCC) acknowledges the close link between RE and addressing climate change. As an international treaty aimed at stabilizing greenhouse gas concentrations, the UNFCCC recognizes renewable energy as a crucial tool for reducing emissions and transitioning to a low- carbon economy. It underscores and highlights the importance of prioritising the advancement and dissemination of renewable energy technologies, strengthening initiatives aimed at building capabilities, and streamlining financial assistance for developing nations. Through its annual Conference of the Parties (COP) meetings, the UNFCCC functions as a forum for international deliberations concerning policies related to RE, technology development, and financing mechanisms. Additionally, Initiatives such as the Clean Development Mechanism (CDM) enable developed nations, the objective is to direct amenities towards renewable energy initiatives in developing nations, with the ultimate aim of promoting the reduction of emissions and the progress of sustainable development. Overall, the UNFCCC plays a significant role in promoting international cooperation and facilitating initiatives that support the integration of renewable energy in the global response to climate change.

During the Earth Summit,⁹⁵ an important outcome came and led to evolution of new jurisprudence related to the notions explained.⁹⁶ According to Principle 1, “human beings are at the centre of concerns for SD; they are entitled to a healthy and productive life in harmony with nature.” Principle 3 deals with, “the realization of the right to development should be carried out in a way that satisfies the developmental and environmental requirements of future generations.” Principle 15 deals with “measures to prevent environmental degradation should not be postponed due to uncertainties in scientific knowledge, particularly when there are indications of significant or irreversible harm.” Principle 16 deals with “the responsibility for the costs associated with pollution should lie with the polluters, while considering the public interest and without disrupting global investment, trade, and commerce.” Principle 20 deals with

⁹⁵ There was adoption of Agenda 21, a comprehensive action plan as well as rights and obligations of nations in relation to sustainable development for achieving sustainable development.

⁹⁶ UN General Assembly, Report of the United Nations Conference on Environment and Development, Rio Declaration, A/CONF.151/26 (Vol. I) (3-14 June 1992).

the, “the full participation of women is essential for achieving sustainable development.”⁹⁷

Agenda 21 recognized the significance of renewable energy in mitigating climate change, reducing dependence on fossil fuels, and promoting environmentally friendly energy sources. It serves as a non-legally binding environmental action plan for the coming century. While it does not carry legal obligations, it provides the foundation for a global alliance committed to sustainable development and environmental preservation on a worldwide scale. The main objective of Agenda 21 is to promote sustainable development by reorienting economic incentives and penalties to support this goal effectively. It also aims to eradicate global poverty by better managing energy and natural resources and enhancing living standards through access to clean water, sanitation, shelter, and waste treatment. Another focus is the improved management of chemicals and waste, as contaminated food and water contribute to significant health issues in developing nations. Furthermore, Agenda 21 strives for the sustainable utilization of global and regional resources, including the atmosphere, oceans, seas, freshwater, and marine organisms. The Chapter 9 focused on the “Protection of the Atmosphere” and emphasized the need to transition to RE technologies. It acknowledged the potential of renewable energy sources such as solar, wind, hydro, and biomass in contributing to achieve objectives of sustainable development and addressed the barriers that impede their widespread use. This statement underscores the significance of advocating for the adoption and implementation of renewable energy technologies as a strategy to diminish greenhouse gas emissions and address the challenges posed by climate change. Agenda 21 emphasizes the need for international cooperation, capacity building, and financial support to facilitate the adoption and transfer of renewable energy solutions, particularly in developing countries. Thus, by integrating renewable energy into energy systems, it aims to enhance energy security, promote cleaner and more sustainable energy sources, and foster sustainable economic growth.

⁹⁷ UN General Assembly, Report of the United Nations Conference on Environment and Development, Rio Declaration, A/CONF.151/26 (Vol. I) (3-14 June 1992).

3.2.5 Kyoto Protocol, 1997⁹⁸

The Kyoto Protocol, an international treaty adopted in 1997, incorporates provisions pertaining to renewable energy. While its primary objective is to combat climate change and reduce greenhouse gas emissions, renewable energy plays a pivotal role in achieving these aims.⁹⁹ The participating countries under the Kyoto Protocol are committed to implementing diverse measures and strategies to curtail their greenhouse gas emissions. These measures include the promotion of renewable energy sources like solar, wind, hydro, geothermal, and biomass. By increasing the proportion of renewable energy in their energy portfolios, countries can decrease their reliance on fossil fuels and subsequently lower emissions. Moreover, the Kyoto Protocol introduced the Clean Development Mechanism (CDM) to facilitate developed nations' investment in renewable energy projects and emission reduction initiatives in developing countries.¹⁰⁰ This mechanism serves to facilitate the dissemination of renewable energy technologies and foster the adoption of SD practises within the developing nations. While the Kyoto Protocol encompasses various aspects beyond renewable energy, it recognises the importance of adopting and the utilisation of RES plays a crucial place in the broader endeavour to address climate change and mitigate GHGs emissions.¹⁰¹

3.2.6 Millennium Summit, 2000¹⁰²

Humanity encounters numerous challenges in striving for equitable development and well-being for all individuals. In 2000, the United Nations established eight goals known as the Millennium Development Goals (MDGs) to address the primary needs of

⁹⁸ Adopted by Resolution No. 14/07 approving the Kyoto Protocol to the United Nations Framework Convention on Climate Change.

⁹⁹ United Nations, 'What Is the Kyoto Protocol?' (*UNFCCC2019*) <https://unfccc.int/kyoto_protocol> accessed 25 May 2023.

¹⁰⁰ United Nations Climate Change, 'Https://Unfccc.int/Process/The-Kyoto-Protocol/Mechanisms' (*unfccc.int1997*) <<https://unfccc.int/process/the-kyoto-protocol/mechanisms>> accessed 28 April 2023.

¹⁰¹ OECD, 'Financial Markets and Climate Transition Opportunities, Challenges and Policy Implications' (2021) <<https://www.oecd.org/finance/Financial-Markets-and-Climate-Transition-Opportunities-Challenges-and-Policy-Implications.pdf>> accessed 26 March 2023.

¹⁰² Adopted by United Nations General Assembly Resolution 55/2 of 2000.

the most impoverished populations. These goals encompassed the following objectives¹⁰³:

1. Eliminate extreme poverty and hunger
2. Attain universal primary education
3. Foster gender equality
4. Reduce child mortality
5. Enhance maternal health
6. Combat HIV/AIDS, malaria, and other diseases
7. Ensure environmental sustainability
8. Forge a global partnership for development

The Millennium Summit in 2000 did not have a specific focus on renewable energy. However, the Millennium Development Goals (MDGs) that were established during the summit indirectly addressed some aspects related to renewable energy. While the MDGs did not explicitly mention renewable energy as a standalone goal, the goal of environmental sustainability indirectly recognized the importance of renewable energy sources in mitigating climate change and promoting sustainable development. The targets under the environmental sustainability goal included integrating sustainable development principles into policies and reversing the loss of environmental resources.

3.2.7 Johannesburg Declaration on Sustainable Development, 2002¹⁰⁴

The 2002 World Summit on Sustainable Development in Johannesburg endorsed a Political Declaration and Implementation Plan that encompassed provisions outlining various actions and strategies to attain environmentally-conscious development. These measures were aimed at promoting sustainable development that incorporates the

¹⁰³ United Nations, 'Millennium Summit' (*United Nations*2000) <<https://www.un.org/en/conferences/environment/newyork2000>> accessed 9 June 2023.

¹⁰⁴ Adopted at the World Summit on Sustainable Development (WSSD), sometimes referred to as Earth Summit 2002, at which the Plan of Implementation of the World Summit on Sustainable Development

principles of environmental preservation. The problem of RE was included in both the Johannesburg Declaration on Sustainable Development from 2002 and the Johannesburg Plan of Implementation from 2003.¹⁰⁵ Both texts acknowledged the significant contribution that renewable sources of energy could contribute towards attaining sustainable development missions and help in mitigating climate change. The texts placed significant emphasis on the necessity of augmenting investments in RE technologies, promoting the progression of sustainable energy sources and facilitating the widespread adoption of renewable energy technologies in developing countries. It specifically highlighted the importance of improving accessibility to affordable, clean and sustainable energy, including renewable energy, particularly for developing countries. In the Declaration, there is no specific chapter or article dedicated solely to renewable energy. However, the declaration emphasizes the importance of sustainable energy sources and the need for increased efforts to promote renewable energy. It, on the other hand, does have specific references to renewable energy. In Chapter IV, Section B, Paragraph 40 of the plan, the statement recognises the necessity of advocating for the adoption of the RES, with a specific emphasis on developing nations, in order to attain sustainable development objectives and effectively tackle the obstacles related to energy accessibility.¹⁰⁶ The paragraph underscores the significance of promoting the transfer of RE technologies and augmenting investments in projects related to renewable energy. Although the documents do not extensively discuss renewable energy, these references indicate that renewable energy is acknowledged and incorporated as a significant element in the discussions on sustainable development at the Johannesburg Summit.

3.2.8 Sustainable Development Goals, 2015¹⁰⁷

The 2030 Agenda for Sustainable Development, adopted unanimously by all United Nations member countries in 2015 during a significant UN Summit, outlines a set of 17 Goals accompanied by 169 specific targets. In the coming fifteen years, nations will

¹⁰⁵ United Nations, 'World Summit on Sustainable Development, Johannesburg 2002' (*United Nations*2002) <<https://www.un.org/en/conferences/environment/johannesburg2002>> accessed 24 May 2023.

¹⁰⁶ United Nations, 'Plan of Implementation of the World Summit on Sustainable Development Contents' (2002) <https://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD_PlanImpl.pdf> accessed 31 May 2023.

¹⁰⁷ Adopted by United Nation General Assembly Resolution 70/1 of 2015.

work collectively towards achieving these universal Goals, which encompass eradicating poverty, addressing inequality, combating climate change, and ensuring inclusivity, leaving no one behind. The impact of climate change on various aspects, such as public health, food and water security, migration, peace, and security, is already evident. If climate change is not effectively addressed, it will reverse the progress made in development and hinder future advancements. Investing in sustainable development is a way to mitigate climate change by reducing greenhouse gas emissions and enhancing climate resilience. Likewise, taking action on climate change is instrumental in driving sustainable development. Addressing climate change and promoting sustainable development are interconnected and mutually supportive. Sustainable development cannot be achieved without climate action, just as many of the Sustainable Development Goals (SDGs) aim to tackle the root causes of climate change. The Millennium Development Goals (MDGs), also known as the Global Goals, were built upon by the Sustainable Development Goals (SDGs). The 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development, which were unanimously adopted by global leaders in September 2015 during a significant UN Summit, officially took effect on January 1, 2016.¹⁰⁸



Figure 8. Sustainable Development Goals¹⁰⁹

¹⁰⁸ United Nations, ‘SDG Summit 2023’ (United Nations2023) <<https://www.un.org/en/conferences/SDGSummit2023>> accessed 1 May 2023.

¹⁰⁹ *Ibid.*

With the intention of serving as an all-encompassing charter for the twenty-first century, the document effectively addresses the wide-ranging challenges faced by the global community. SDG 7, which aims to “ensure access to affordable, reliable, sustainable and modern energy for all” as it is a crucial objective that affects all nations and individuals. To fully grasp the importance of achieving this goal and understand the necessary actions, it is essential to examine the goal itself. SDG 7 encompasses four interconnected dimensions: affordability, reliability, sustainability, and modernity.¹¹⁰ These dimensions are not independent of each other but rather intersect and, in some cases, even rely on one another. The Goal 7 focuses on some particular target areas such as:

- Goal 7.1: Ensure that by 2030, everyone has access to affordable, reliable, and modern energy services.
- Goal 7.2: By 2030, significantly increase the proportion of renewable energy in the global energy mix.
- Goal 7.3: Help to double the global rate of improvement in energy efficiency by 2030.
 - ✓ Goal 7(a): By 2030, strengthen international collaboration to facilitate access to research, technology, and investments in clean energy, including renewable energy, energy efficiency, and advanced and cleaner fossil fuel technologies.
 - ✓ Goal 7(b): By 2030, improve infrastructure and technology for providing modern and sustainable energy services to all people in developing countries, especially in the least developed countries, small island developing states, and land-locked developing countries, in accordance with their respective support programs.

Collectively, the targets of Goal 7 work towards tackling energy poverty, advancing the uptake of renewable energy, enhancing energy efficiency, promoting global cooperation, and guaranteeing universal comprehensive access to modern and

¹¹⁰ United Nations, ‘Goal 7—Ensure Access to Affordable, Reliable, Sustainable and Modern Energy for All | United Nations’ (www.un.org April 2015) <<https://www.un.org/en/chronicle/article/goal-7-ensure-access-affordable-reliable-sustainable-and-modern-energy-all>> accessed 11 June 2023.

sustainable energy.¹¹¹ This comprehensive approach contributes to building a sustainable and inclusive future.¹¹²

3.2.9 International Year of Sustainable Energy for All, 2012¹¹³

The former United Nations Secretary-General, Ban Ki-moon expressed three interrelated goals that are intended to be accomplished by 2030 i.e., the aim is to accelerate the pace of enhancing energy efficiency by twofold, “the aim is to ensure universal access to contemporary energy services on a global scale, as well as to achieve the goal of increasing the proportion of renewable energy in the global energy mix by two-fold.”¹¹⁴ The vision of Sustainable Energy For All is sought to be achieved which is in line with the Paris Agreement on Climate change. In order to cater the needs, an international organization i.e., Sustainable Energy for All (SEforALL) works in consonance with the goals targeted to be achieved by the year 2030. It is collaborating with the United Nations, governmental leaders, private sector entities, civil society, financial institutions, and philanthropic organizations to accelerate progress towards attaining Sustainable Development Goal 7 (SDG7) i.e., the objective is “to ensure universal access to dependable, economically viable, contemporary, and environmentally sustainable energy by end of the year 2030.”¹¹⁵ The efforts revolve around facilitating an equitable transition towards clean energy, where no individual is excluded and everyone has access to new prospects for realizing their full potential. After the year 2012, the decade 2014- 2024 was declared as “UN Decade of Sustainable Energy for All.”¹¹⁶

¹¹¹ UNEP, ‘GOAL 7: Affordable and Clean Energy’ (*UNEP - UN Environment Programme* 2 October 2017) <<https://www.unep.org/explore-topics/sustainable-development-goals/why-do-sustainable-development-goals-matter/goal-7>> accessed 8 June 2023.

¹¹² *Ibid.*

¹¹³ Sustainable Energy For All, ‘History’ (*Sustainable Energy for All | SEforALL* 2021) <<https://www.seforall.org/who-we-are/history#:~:text=Under%20Rachel%20Kyte>> accessed 14 May 2023.

¹¹⁴ *Ibid.*

¹¹⁵ United Nations, ‘International Year of Sustainable Energy for All - 2012’ (*www.un.org* 2012) <<https://www.un.org/en/events/sustainableenergyforall/#:~:text=Sustainable%20Energy%20for%20All>> accessed 2 June 2023.

¹¹⁶ United Nations Secretary General, ‘United Nations Decade of Sustainable Energy for All Report of the Secretary-General Summary’ (2015) <https://sustainabledevelopment.un.org/content/documents/8533SG%20Report_UN%20Decade%20of%20Sustainable%20Energy%20for%20All-advance.pdf> accessed 14 May 2023.

Therefore, through a comprehensive examination of the international conventions, it becomes evident that energy serves as a central focal point, influencing various human activities. Instead of viewing energy in isolation, it should be recognized as a catalyst for socio- economic development and the utilisation of RES, whether directly or indirectly, will have the effect of leading to a more sustainable future for the environment while also helping to reduce the effects of climate change.

3.3 Need of Sustainable Development and Renewable Energy

3.3.1 What is Sustainable Development?

The concept of “development” is possible to interpret it in a number of different ways depending on the culture of the country that is under consideration; however, if measured from the point of view of a nation's rate of economic growth, it would be simpler to determine the level of development that a country possesses. There are a number of situations where economic growth was not accompanied by similar advance in human development, and their economic success was achieved at the expense of higher inequality, unemployment, weak democracy, or overconsumption of natural resources. One such example is China, where economic growth was not supported by equivalent progress in human development. According to the opinions of industry professionals, this type of growth and development is not sustainable, which is where the concept of “sustainable development” comes into play.¹¹⁷ The objective of the concept that is recognised as SD is to “achieve a state of equilibrium in which social and economic development, the conservation of natural resources, and the defence of the natural environment are all safeguarded.”¹¹⁸ As a result, SD strives to achieve primary three goals: the protection of the environment; justice among nations, persons, and generations; and the achievement of economic effectiveness and efficiency.

The definition of “Sustainable Development” that is offered in the Brundtland Commission’s Report in 1972, “Our Common Future,” is the one that has gained the most popularity. This definition states that “It is development that meets the needs of

¹¹⁷ TP Soubbotina, ‘Beyond Economic Growth: An Introduction to Sustainable Development’ (www.worldbank.org2010)

<http://www.worldbank.org/depweb/english/beyond/beyondco/beg_00.pdf> accessed 2 June 2023.

¹¹⁸ *Ibid.*

the present without compromising the ability of future generations to meet their own needs.”¹¹⁹ There are two components that make up the definition¹²⁰:

1. The belief that restrictions are imposed on the potential of the environment to accommodate existing and future needs.
2. The idea of “needs,” in particular the fundamental prerequisites of the underprivileged people of the globe, which should be accorded the utmost and greatest consideration.

The World Bank published a paper in 1992 that detailed a three-staged plan for turning the idea of sustainable development into an achievable goal. Building on the good links, eliminating the bad links, and clarifying and controlling the uncertain links are the three components that make up this step. Since the 1972 Earth Summit in Stockholm, there has been a significant increase in the number of environmental laws and organisations in countries all over the world. The destruction of the environment has been slowed down or even reversed thanks in large part to the laws and institutions that have been put into place. Despite this, there is a growing recognition of the existence of a substantial disparity between the stipulations outlined in environmental legislation and their practical execution and enforcement. This disparity is observed to be prevalent in both developed and developing nations to an equal extent. This development is accompanied by a growing understanding of this gap.¹²¹ The rule of law regarding the environment serves as a vital foundation for the four pillars of sustainable development, which are “economic growth, social progress, environmental preservation, and peace.”¹²² It does this by infusing environmental goals with the fundamentals of rule of law and by serving as a foundation for the reform of environmental legislation and governance. The prioritisation of environmental rule of law becomes particularly crucial when we acknowledge the extensive scope of its benefits, which extend beyond the confines of the environmental sector. Although it has the most direct impact on

¹¹⁹ United Nations Brundtland Commission, ‘Report of the World Commission on Environment and Development: Our Common Future’ (1987) <<http://www.un-documents.net/our-common-future.pdf>> accessed 2 June 2023.

¹²⁰ Philippe Sands and others, *Principles of International Environmental Law* (3rd edn., Cambridge University Press 2019) 252 252–253.

¹²¹ United Nations Environment Programme, ‘ENVIRONMENTAL RULE of LAW First Global Report’ (2019) <https://wedocs.unep.org/bitstream/handle/20.500.11822/27279/Environmental_rule_of_law.pdf?sequence=1&isAllowed=y> accessed 24 March 2023.

¹²² *Ibid.*

environmental protection, it also helps to strengthen the rule of law in general, the promotion of equitable social and economic growth, the protection of the general well-being, the contribution to peace and security through conflict prevention and resolution, and the safeguarding of human and constitutional rights are key objectives. In a similar vein, the rule of law is an essential component in matters pertaining to the environment “for equity in terms of the advancement of the Sustainable Development Goals, the provision of fair access by assuring a rights-based approach, and the promotion and protection of environmental and other socio-economic rights.”

Amartya Sen argues for a broadening of the concept of sustainable development, which is the most dominant subject of environmental literature, from a need-based standard to a norm based on freedoms.¹²³ This is due to the fact that sustainable development is the most prevalent topic discussed in academic papers relating to the environment. As a result of this recharacterization, it entails conserving and, where feasible, even expanding the fundamental liberties and skills that individuals have living in the present without compromising the potential of subsequent generations to have comparable or even more liberties. This is done without jeopardising the capability of present individuals to have comparable or even greater autonomy in the future. Therefore, both intragenerational and intergenerational equity are advanced by the interconnected ideas of environmental rule of law. The concept of intergenerational equity mandates that each generation make use of and develop its natural and cultural legacy in such a way that it can be handed down to subsequent generations in the same or better state as it was in when it was first received. The protection of available alternatives for the continued usage of resources in the future and the upkeep of a high standard of the natural environment are the primary focuses of this concept. The ideal foundation for the relationship that should exist between one generation and the next is established by intergenerational equity. On the other hand, intragenerational equality, seeks to rectify inequalities that exist within the present generation. Intragenerational equity addresses the question of how to apportion responsibility for environmental protection among states that have different economic realities, differing degrees of contribution to environmental problems, and differing environmental and developmental needs and priorities. This is a question that is relevant because different states face different

¹²³ Amartya Sen, ‘SUSTAINABLE DEVELOPMENT and OUR RESPONSIBILITIES’ (2010) <https://www.unipol.it/sites/corporate/files/document_attachments/sen_2010_eng_ugf_01-01-2010_en.pdf> accessed 9 June 2023.

challenges in these areas. Therefore, intragenerational justice takes into account the unique requirements of developing countries; in global environmental conventions, this is best characterised as the provision of financial support, the development of capacity. In addition, the incorporation of the concept of common but differentiated responsibilities has been pursued.

3.3.2 Concept of Sustainable Energy

Sustainable Energy encompasses any energy source that is incapable of running out and can continue to function indefinitely. The concept of sustainable energy refers to the generation of energy in a manner that effectively addresses current challenges while ensuring the capacity of future generations to tackle their own issues is not compromised. The replacement or replenishment of energy sources is not a requisite; sustainable energy effectively meets our energy demands while mitigating the potential risks of exhaustion or depletion. The solution is the acceleration usage of the sustainable energy whose sources mean those which do not deplete environment and are natural resources, such as wind power, solar electricity, geothermal power, wave power, and tidal power. It typically also encompasses several technologies that enhance energy efficiency. This means that the sustainable energy is a composition of dual features i.e., renewable energy (RE), energy conservation and efficiency.¹²⁴ Both from the point of view of the economy and from the broader point of view of society's interest in continuing to exist, sustainable energy is at the forefront of any and all discussions concerning "sustainable development." The generation and consumption of energy are at the heart of the problem of climate change on a worldwide scale. Energy is essential to all parts of the economy. The importance of dependable energy sources to the functioning of the economy has long been recognised. Energy and the regulation of energy resources are important factors in government, in addition to their role in driving the global economy. It is widely acknowledged that a productive utilisation of energy and supplies that are dependable, cost-effective, and less contaminating are crucial, if not indispensable, components of SD. There is an increasing consensus among researchers and practitioners that sustainable development policy pertains to three crucial elements that must be addressed concurrently: the economic, social, and

¹²⁴ Johns Hopkins University, 'Renewable Energy vs Sustainable Energy: What's the Difference?' (*MA in Sustainable Energy* July 2021) <<https://energy.sais.jhu.edu/articles/renewable-energy-vs-sustainable-energy/>> accessed 27 April 2023.

environmental. On the contrary, other jurist and environmental activists considers development and dissemination of alternative energy technologies with the goal of giving a greater share of the energy mix to renewable energies and improving energy efficiency; connects between energy and sustainable development and advocates for the integration of energy considerations, such as energy efficiency, affordability, and accessibility, into socio-economic programmes; the aim is to broaden the range of energy sources by creating advanced, economically viable, and eco-friendly alternatives, while also incorporating energy-related factors like efficiency, affordability, and accessibility. From both the point of views, it is important to note that the drive towards the path of SD and energy lies in the increase of the utilization and incorporation of the renewable energy sources by the nations.

3.4 Inter- connection of the Sustainable Development, Renewable Energy and Climate Change

The three terms are inter- linked with each other and are mutually reinforcing.¹²⁵ For this to understand, it is significant to look into the aspects of relationship of the renewable energy with both SD and Climate change. On the one side, the RE plays a substantial role in providing clean and cost- efficient energy especially to the remote areas. This has resulted in the growth of the socio- economic developments, for instance improvement of living standards, lessening of the energy poverty. Likewise, the upgraded technologies have contributed in the economy growth and the energy mix sector of a country. These opportunities have stimulated the ideas and innovations by reducing the dependency on the exhaustible fossil fuels. This has shot the improvement in the air index of the nation, impliedly reducing climate and environmental harms. The concept of longevity for future needs and utilization of the resources by reducing the impact on environment contributes to SD in every sense. On the other side, on the positive note of this, it can be noted that the reduction of the GHGs will have an important and massive impact in mitigation the climate change. Increasing the scale in the usage of the RES will contribute to low- carbon economy i.e., displacing fossil- fuel

¹²⁵ Vally Koubi, ‘Sustainable Development Impacts of Climate Change and Energy’ (2019) <https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/SDO_BP_Koubi.pdf> accessed 27 May 2023.

based generation in many sectors.¹²⁶ Therefore, RE projects can be enhanced by the method of climate resilience and reduce climate- related vulnerability in the nation.

3.4.1 United Nations Economic and Social Council

The Development Report on the ninth session (CSD-9)¹²⁷ highlights that energy plays a crucial role in attaining sustainable development objectives, yet there is still a substantial segment of the worldwide population that does not have access to energy and transport services. The majority of this population lives in developing nations. There are significant differences in the levels of energy consumption both within developed countries and between developed countries and developing countries. These differences underscore the unsustainable nature of the practises now employed in the production, distribution, and utilisation of energy. Developed countries should offer environmentally sound technological alternatives to their developing counterparts. Achieving energy for sustainable development necessitates substantial efforts and investments from the private sector. This can be accomplished through universal access to a cost-effective energy mix that suits the diverse needs and requirements of different countries and regions. Ensuring sufficient and affordable energy access for current and future generations is of utmost importance, while also considering environmental compatibility, social acceptability, and economic viability (intergenerational equity). This report also highlights the importance to generate and make use of locally sourced forms of RE, work to make renewable energy technologies more accessible financially, and increase aid to nations still in the process of economic development.¹²⁸ Similarly, in the Development Report on the fourteenth session (CSD-14)¹²⁹ a detailed set of the guidelines and principles are provided to include the energy for SD, measures to boost industrial development and to check the air and environment changes. The report provided its guidelines in consonance with the aim to achieve Sustainable Development

¹²⁶ Rajat Gupta and others, 'Decarbonising India: Charting a Pathway for Sustainable Growth | McKinsey' (www.mckinsey.com27 October 2022) <<https://www.mckinsey.com/capabilities/sustainability/our-insights/decarbonising-india-charting-a-pathway-for-sustainable-growth>> accessed 8 June 2023.

¹²⁷ United Nations Economic and Social Council, 'Commission on Sustainable Development Report on the ninth session CSD-9' E/CN.17/2001/19UN E/CN.17/2001/19 (April16-27, 2001).

¹²⁸ Sustainable development knowledge platforms, 'Decision:9th sessions on the commission on sustainable development, commission on sustainable development' <<https://sustainabledevelopment.un.org/index.php?menu=1415>> accessed 5 June 2023.

¹²⁹ United Nations Economic and Social Council, 'Commission on Sustainable Development Report on the fourteenth session CSD14 Thematic Cluster :Energy for SD 2006', UN E/CN.17/2006/15(SUPP), (April 22, 2005 and May1-12, 2006).

Goals (SDGs) and Millenium Development Goals (MDGs), particularly in reducing poverty. Access to modern energy services for cooking and heating brings multiple benefits, such as improves health, reduce indoor air pollution, access of better income opportunities for women and children in rural and remote communities, including schools, clinics, and hospitals; affordable power is also important in the urban areas. Likewise, Development Report on the fifteenth session CSD-15¹³⁰ highlighted that the States have Common but Differentiated Responsibilities (CBDR) which are indispensable and substantial in nature. There is a strong correlation between energy and climate change, necessitating collective action based on solidarity. No individual state or region can effectively address the issue alone. Developing countries have emphasized the need for financial resources and the transfer of environmentally friendly technologies, facilitated by a multilateral fund. Furthermore, it is crucial for countries to incorporate energy and climate change concerns into their national development plans and goals in order to achieve sustainable development. Increasing the share of renewable energy in the energy mix of the nation, enhancing energy efficiency, and promoting advanced energy technologies, including those utilizing fossil fuels, are essential components of this endeavour. Hence, it is imperative to prioritise the diversification of energy sources, which includes the incorporation of renewable energy, nuclear energy, and cleaner fossil fuels in all relevant sectors of the globe.

3.4.2 United Nations General Assembly Resolution

By reiterating the pledges, it had made before in the Rio Declaration on Environment and Development 1 and in Agenda 21, the UN declared the International Year of Sustainable Energy for All¹³¹ is an international endeavour that was created with the intention of promoting and putting a greater emphasis on having access to sustainable energy, being efficient in energy use, and using renewable energy sources. As per the Sustainable Development Goal 7 (SDG7) outlined by the United Nations, it acts as a platform to raise awareness, mobilise action, and accelerate progress towards attaining the goal of ensuring that all individuals and communities have equitable and reliable access to energy sources that are environmentally sustainable in the long term which is the universal access to sustainable energy. The objective is to promote collaboration

¹³⁰ United Nations Economic and Social Council, 'Commission on Sustainable Development Report on the fifteenth session CSD' UN E/CN.17/2001/19, (May12, 2006 and April 30-May 11, 2007).

¹³¹ UN General Assembly, International Year of Sustainable Energy for All, 65th Session, UN A/RES/65/151 (February 16, 2011).

between governments, organisations, businesses, and communities in order to accelerate transformative change in the energy sector, improve energy efficiency, increase the share of renewable energy, and guarantee widespread availability of energy services that are cost-effective, dependable, and up-to-date. Along with that, UN declared 2014–2024 as the Decade of Sustainable Energy for All¹³² with the intention to mobilize global efforts in order to fulfil the objective of attaining widespread availability of sustainable energy by the year 2030, as delineated in Sustainable Development Goal 7 (SDG7). The primary objective is to cultivate collaborations among governmental bodies, international institutions, private enterprises, and non-governmental organisations in order to expedite the implementation of environmentally-friendly energy alternatives and facilitate the mobilisation of financial resources in the energy industry. The Decade aims to address the energy challenges faced by developing countries and underserved populations, particularly in areas of energy access, energy efficiency, and renewable energy adoption. It provides a framework for raising awareness, promoting policy dialogue, sharing best practices, and mobilizing resources to facilitate the transition towards sustainable energy systems globally. Additionally, it encourages countries to develop comprehensive national energy plans, strengthen regulatory frameworks, and promote innovation and technology transfer in the energy sector. It was noted that United Nations General Assembly resolution titled “The future we want- 2012” also known as Rio+20¹³³, emphasizes the need to address the interlinked challenges of poverty eradication, environmental sustainability, and social equity. It recognizes that sustainable development should be guided by the principles of respect for nature, human rights, and the promotion of a just and inclusive society. The resolution highlights the importance of integrating economic, social, and environmental dimensions in decision-making processes at all levels. Additionally, the resolution emphasizes the role of education, science, and technology in achieving sustainable development goals.

3.4.3 Establishment of International Energy Agency (IEA)

The International Energy Agency (IEA) emerged in 1974 as part of the Organisation for Economic Cooperation and Development (OECD). The IEA signifies a central duty

¹³² United Nations General Assembly, Promotion of new and renewable sources of energy, 67th UN A/RES/67/215 (December 21, 2012).

¹³³ United Nations General Assembly, The future we Want, UN/A/RES/66/288 (July 27, 2012).

in the worldwide discourse on energy matters, offering expert evaluations, statistical information, policy guidance, and practical remedies to assist nations in ensuring reliable and environmentally sound energy access for their populations. The fundamental objective of the International Energy Agency (IEA) is to serve as a facilitator for collaboration among its member nations with the goal of improving energy security through the expansion of energy supply options and the encouragement of energy conservation and the adoption of cleaner and more efficient energy practises. The agency pertains to the establishment and execution of a comprehensive, extended collaboration initiative aimed at diminishing reliance on imported oil. This programme encompasses various strategies such as energy conservation, the advancement of alternative energy sources, energy research and development, and the provision of natural and enriched uranium.¹³⁴ Later on 1974 by an accord, Agreement on International energy Programme (IEP) was globally recognised. This has been amended with the need of the society, environment and the global nations. The objective of the latest amended 2018 version of this agreement is to foster collaboration among member nations during instances of significant disturbances in the provision of oil or alternative energy resources.¹³⁵ The accord delineates the actions to be implemented by participating nations for the purpose to ensure that adequate and reliable energy resources are always available in the unfortunate circumstance that such shortages occur. The statement underscores the significance of information exchange, collaborative efforts, and synchronisation in addressing the unfavourable consequences of energy supply interruptions on the worldwide economy. Therefore, it is generally agreed upon that in order to slow or stop the effects of climate change, sustainable development is the only solution. An examination of each of these norms reveals that there is widespread consensus that the objective of sustainable development cannot be achieved without the utilisation of sustainable energy. In addition, sustainable energy cannot be obtained from conventional sources, such as fossil fuels and hydrocarbons. Thus, in order to achieve sustainable energy, which is a crucial driver of sustainable development, we must turn to renewable energy, which is

¹³⁴ Decision of The Council Establishing an International Energy Agency of the Organisation <<https://www.iea.org/media/about/decisionofthecouncil.pdf>> accessed 11 June 2023.

¹³⁵ International Energy Agency, Agreement on International Energy Programme <<https://www.iea.org/media/about/IEP.pdf>> accessed 13 June 2023.

effective, does not produce pollution, and is replenishable. As a result, conventional sources of energy should take a back seat to renewable sources of energy.

Chapter- 4

Legal Framework Related to Renewable Energy in India

4.1 Introduction

Renewable energy is one of the methods by which a transition towards environmentally friendly energy entails investing in the future of our country. It is rightly said that the renewable energy (RE) is unparalleled in the context of producing energy and it surpasses any other mechanisms because they relatively help in diminution of pollution in the environment as well helps to mitigate with the climate change. The advanced economies are aware that switching to renewable energy is necessary because non-renewable sources are perishable and they are not available forever. India is one of the top producers of this renewable energy in the world and has begun focusing on developing its renewable energy sources (RES) to contribute in the sustainable world. The amount of energy that India consumes places it in third place among all countries in the globe and fourth globally in the Renewable Energy Installed Capacity which includes Large Hydro, Wind and Solar Power capacity. India has aimed at COP26 to achieve its magnified goal of 500 Giga-Watt (GW) of the effective utilisation of non-fossil fuel-derived energy sources by the year 2030.¹³⁶ India was one of the world's fastest-expanding economies, according to the World Bank's recently released India Development Update, considering the fact that numerous obstructions in the global environment persist.¹³⁷ Although, inflation remained high but the overall growth in the Gross Domestic Product (GDP) of the country remained healthy and is predicted to be 6.9 percent for the full year with this scaling 7.7 percent year-on-year for the initial three months of the financial year 2022- 2023.¹³⁸ The World Bank re-examined its FY23/24 GDP prediction of 6.4 percent to 6.6 percent (December 2022). The development is projected to be restrained by languid growth in consumption and challenging exterior circumstances. According to the Asian Development Bank (ADB),

¹³⁶ REN21, 'RENEWABLES 2022 GLOBAL STATUS REPORT' (www.ren21.net2022) <<https://www.ren21.net/gsr-2022/>> accessed 11 June 2023.

¹³⁷ World Bank, 'Indian Economy Continues to Show Resilience amid Global Uncertainties' (*World Bank*2023) <<https://www.worldbank.org/en/news/press-release/2023/04/04/indian-economy-continues-to-show-resilience-amid-global-uncertainties>> accessed 29 May 2023.

¹³⁸ *Ibid.*

India's gross domestic product (GDP) is forecasted to experience a gradual slowdown, reaching 6.4% in fiscal year (FY) 2023, concluding on 31 March 2024. Subsequently, it is projected to increase to 6.7% in FY2024. (Figure 9) This growth will be propelled by private consumption and private investment, supported by government initiatives aimed at enhancing transport infrastructure, logistics, and the overall business environment.

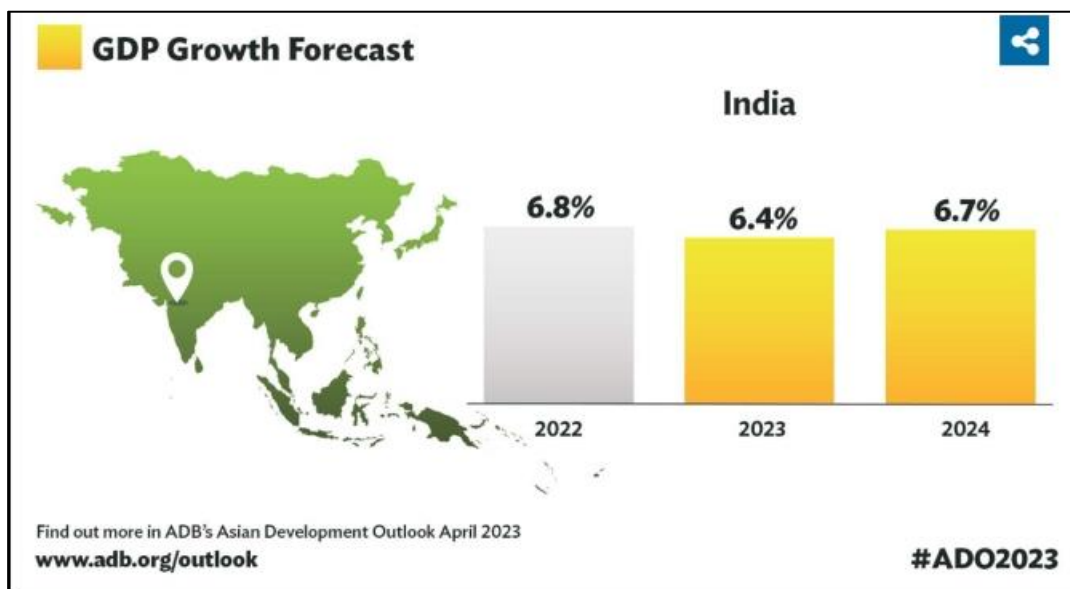


Figure 9. Asian Development forecast of GDP Growth of India (2022-2024)¹³⁹

The RE production in the developing country like India has a direct relationship with the nation's economy as well as the climate change. This can boost the Gross Domestic Product (GDP) of the country as it will provide a wide platform for economic activities and job creation opportunities. Also, reducing the nation's reliance on fossil fuels, utilising energy sources that have adverse effects on the environment and climate represents a strategy to fulfil energy requirements while simultaneously addressing said demands. Therefore, the incorporation of renewable energy (RE) would have a substantial impact on promoting the development of a dependable and environmentally sustainable energy sector, thereby yielding favourable implications for the overall expansion of the GDP. The improved accessibility to the energy would also enhance the productivity and the engagement on a large scale. These bulk generation and

¹³⁹ Asian Development Bank, 'India's Economy to Grow by 6.4% in FY2023, Rise to 6.7% in FY2024' (Asian Development Bank 4 April 2023) <<https://www.adb.org/news/india-economy-grow-6-4-fy2023-rise-6-7-fy2024>> accessed 30 April 2023.

production will substantially lower the hazardous emission of the GHGs, which is evident will be less as compared to fossil- fuels.

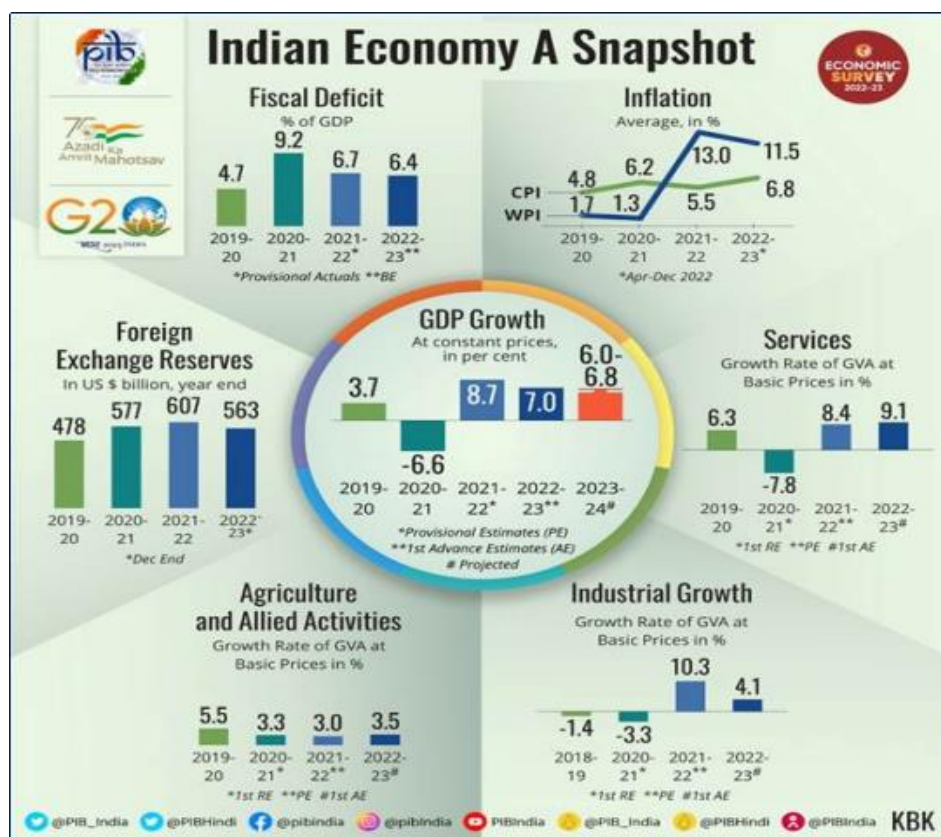


Figure 10. Indian Economy and GDP Growth Survey 2022-2023¹⁴⁰

India has the potential to mitigate its carbon emissions, tackle the complexities associated with the effects of climate change, and accomplish its global responsibilities pertaining to climate action by augmenting its RE capacity. This will eventually result in the reducing the air pollution which conventional sources such as coal, petroleum, oil etc. of energy contribute in the atmosphere, resulting various health complications. Thus, by augmenting the proportion of RE in the energy mix, there is a reduction in detrimental emissions, resulting in enhanced air quality and positive public health outcomes. The more utilization of the RES in maximum sectors of the nation will assist in the development of climate resilience, diversify energy sources and diminish susceptibility to fluctuations in fossil fuel prices and lead to disruptions in supply. It is

¹⁴⁰ Ministry of Finance, Government of India, 'SUMMARY of the ECONOMIC SURVEY 2022-23' (*pib.gov.in* 31 January 2023) <<https://pib.gov.in/PressReleasePage.aspx?PRID=1894932>> accessed 2 June 2023.

crucial to recognize that the precise effects can vary depending on factors such as the magnitude and speed of RE implementation, policy structure and frameworks, technological progress, and contextual elements.

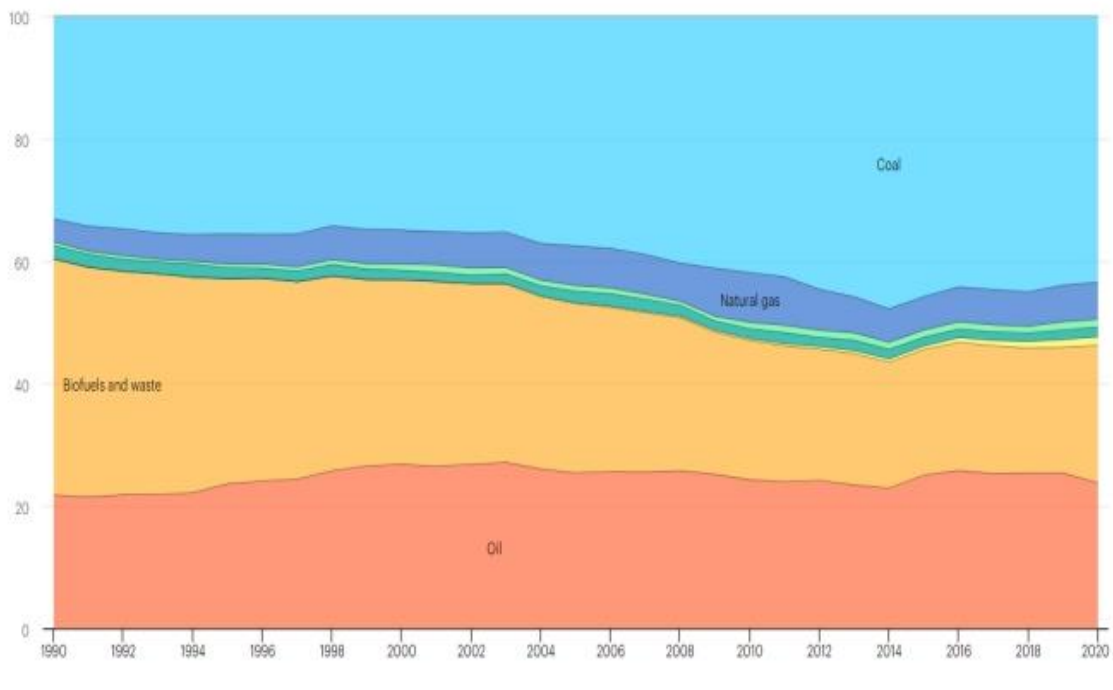


Figure 11. Total Energy Supply in India graph by IEA (1990- 2020)¹⁴¹ Here: ● Coal ● Natural Gas ● Nuclear ● Hydro ● Wind, Solar etc. ● Biofuels and waste ● Oil

By the IEA, current contribution of the energy in the different supply chain is calculated. Although, the share of wind, solar is negligible in the starting of the year 1990 but gradually there is a shift in the usage which is 516546.0 Terajoule (TJ), hydro power at 579272.0 TJ and natural gas supply at 2201934 TJ (Figure 11). This number shows a significant shift in the supply of biofuels and waste. It can be said that India is on a path of sustainable environment, achieving energy security, grasping substantial economic opportunities with price stability, it just needs to focus on its consumption of coal which is significantly reducing year-on-year. Thus, India can revitalize its research and development in the clean energy technologies in order to achieve the efficiency and technological advancement. According to the Ministry of Finance, Government of India, the economy is predicted to increase by 7 percent for the year ending March 2023

¹⁴¹ International Energy Agency, 'India - Countries & Regions' (IEA2020) <<https://www.iea.org/countries/india>> accessed 23 May 2023.

depending on the pace of political and economic advancements around the world, which implies an 8.7 percent expansion from the year prior.¹⁴²

Also, by the economic survey of the Ministry of Finance by the Government of India¹⁴³, India has made a significant commitment by declaring a Net Zero Pledge, aiming to achieve a net zero emissions target by 2070, accompanied by the launch of a mass movement called LIFE - Lifestyle for Environment, and the establishment of the National Green Hydrogen Mission with the goal of achieving energy independence by 2047. In February 2023, the total electricity generated from renewable sources in India reached a significant milestone of 25.7 Terawatt-hour (TWh), marking a year-on-year increase of 13.7% or 3.1 TWh compared to the same month in the previous year. This means the renewable capacity reached 168.96 GW for the same period.¹⁴⁴ The primary contributors to this growth were solar power, which saw a remarkable increase of 31.3% year-on-year, and hydropower, which experienced an 11.5% increase. Meanwhile, wind generation remained relatively stable with a slight growth of 0.6% year-on-year. Overall, renewable energy sources constituted 19.1% of India's electricity generation, with solar power achieving a record-high share of 6.9%.

4.2 Future of Renewable Energy in India

The announcement by India that it intends to achieve net zero emissions by 2070 and to meet half of all of its electricity needs from renewable sources by 2030 equates to an historic phase in the global effort to tackle climate change. India now ranks third in the world for annual CO₂ emissions due to the significant increase in the country's use of fossil fuels. The typical Indian household uses a tenth of the amount of electricity the typical American household does.¹⁴⁵ Although the magnitude for evolution in India is astounding, it has seen some of the fastest economic growth rates globally over the past 20 years, pulling millions of people out of poverty. India is setting the standard for an

¹⁴² *Ibid.*

¹⁴³ Ministry of Finance, GOI, 'ECONOMIC SURVEY 2022-23: HIGHLIGHTS' (*pib.gov.in* 31 January 2023) <<https://pib.gov.in/PressReleasePage.aspx?PRID=1894929>> accessed 6 April 2023.

¹⁴⁴ Press Trust of India, 'India's Renewable Energy Capacity Reaches 168.96 GW till Feb 2023: Minister R K Singh' *The Economic Times* (21 March 2023) <<https://economictimes.indiatimes.com/industry/renewables/indias-renewable-energy-capacity-reaches-168-96-gw-till-feb-2023-minister-r-k-singh/articleshow/98862427.cms>> accessed 9 June 2023.

¹⁴⁵ Fatih Birol and Amitabh Kant, 'India's Clean Energy Transition Is Rapidly Underway, Benefiting the Entire World – Analysis' (*IEA* 10 January 2022) <<https://www.iea.org/commentaries/india-s-clean-energy-transition-is-rapidly-underway-benefiting-the-entire-world>> accessed 8 June 2023.

innovative model to economic growth that might circumvent the carbon-intensive strategies that several countries have historically embraced and serve as a model for other emerging economies. Down lately, coal and oil have been the foundation for India’s economic development and modernization, providing an increasing number of Indians with access to contemporary energy services. For the previous ten years, this has included adding new energy connections for 50 million people annually. In the goal of achieving net zero emissions by the year 2070, it is projected that the majority of the increase in energy demand during this decade will need to be fulfilled by utilizing low-carbon energy sources.

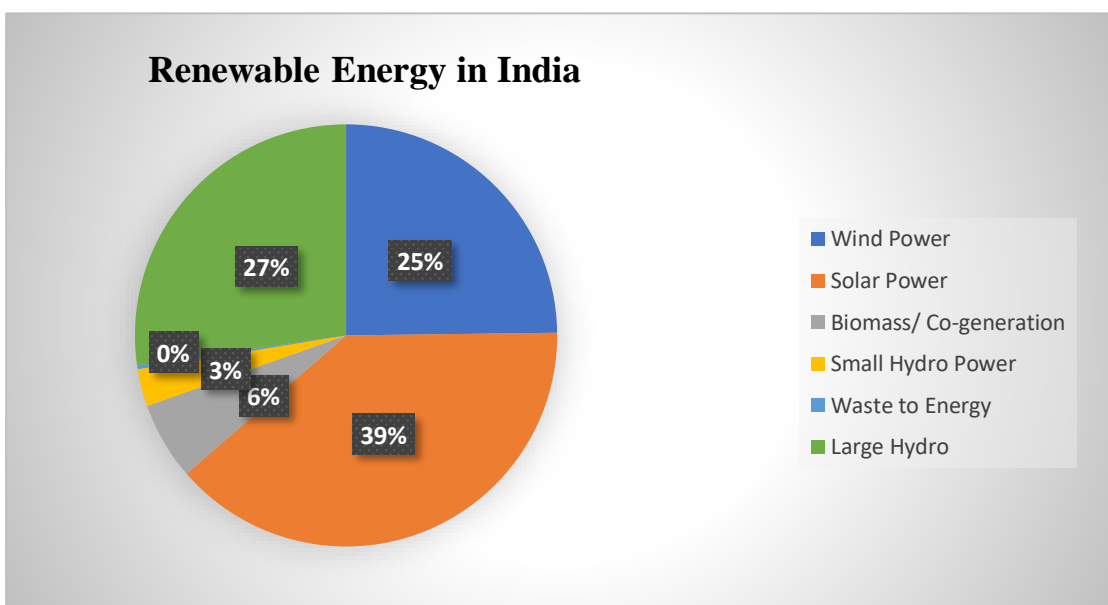


Figure 12. Installed Grid Interactive Renewable Power Capacity in India as of February, 2023. (RES MNRE)¹⁴⁶

Thus, it can be said that the announcement done by the Prime Minister of India, Mr. Narendra Modi to achieve the target foreseen by the UNFCCC, by the 2023 which aspires to reduce the emission intensity of the economy by a percentage of forty- five, also the installations of at least 500 GW of renewable energy capacity and minimizing a billion tons of carbon-dioxide.¹⁴⁷ Figure12 pertains to emerging and rapidly advancing renewable energy sources overseen by the Ministry for New and Renewable

¹⁴⁶ Amit Manohar, ‘Renewable Energy’ (www.investindia.gov.in2022) <<https://www.investindia.gov.in/sector/renewable-energy>> accessed 5 May 2023.

¹⁴⁷ The Union Cabinet, Government of India, ‘Cabinet Approves India’s Updated Nationally Determined Contribution to Be Communicated to the United Nations Framework Convention on Climate Change’ (pib.gov.in3 August 2022) <<https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1847812>> accessed 26 April 2023.

Energy (MNRE). Presently, the country has successfully installed a cumulative capacity of 178.79 GW from non-fossil fuel sources (RES) as of February 2023. So, it has been rightly predicted that the capacity size of generation for India will expand by a margin of seven for the purpose to fulfil the requirements of the current population projection. The dual path for renewable power generation and energy efficiency can be judiciously taken up by keeping the concept of energy conservation in our minds and with the help of awareness and creating a supportive administration of renewable energy mechanisms. These activities must aim to achieve the compliance with the budding RE deployment targets as well as a supportive system policy can be built with the help of research in the grid and off- grid business models.

Although, it is true that the dependence of developing countries like India, still rely on the fossil fuels or non- renewable energy such as coal, natural gases are quite dominant in the energy sector in India. As it is known, India has abundant coal reserves, and the coal is the main source of generation of electricity in India. The usage leads to greenhouse gas emission as well as air pollution. Nevertheless, petroleum products and oil play a substantial role in global consumption of energy. However, considering the projected oil price trends, it is anticipated that the role of non-RE sources will decline within the energy sector of India. In spite of the fact that the natural gas is regarded as relatively cleaner fossil fuel in contrast to oil and coal, but it represents close to negligible share in the energy sector of India. Along with that, India faces challenges to grant access of reliable energy sources to its vast population, especially in the rural areas and ultimately meet its end needs with the conventional sources of energy due to cheaper monetary expenses. As determined by India, by recognizing the ecological and climate change impacts, the significant efforts are made in order to reduce its energy sector dependency on the non- renewable energy sources of energy in its economy. The Government of India has thus, set ambitious and practical targets that can be achieved for utilization of renewable energy, on the top of those substantial national guidelines and policies, and stimulated innovative projects to achieve the targets of sustainable and cleaner energy sector economy in the nation. Furthermore, India is considered as the third largest producer of the renewable energy all around the globe having overall

capacity of over 4 lakh MW, with the 40% of its installed electricity capacity generated coming from non- fossil fuel energy sources.¹⁴⁸

The future and potential of RE sector looks bright and promising because it has expected to play a significant in the India's energy mix sector. The prospects of the RE sector are likely to increase as India demonstrates a pioneering and progressive commitment to the clean energy. As the ambition to achieve 450 GW of RE capacity by the year 2030 is considered as one of the India's plans for this expansion among one of the most extensive roadmaps in the world.¹⁴⁹ Therefore, the objective of the Government of India is crystal apparent, and this will, at some point in the future, contribute to a spike in the proportion of renewable sources in the national energy domain. The awareness is increasing with the help of many significant activities, projects and programs that are being conducted on the regular basis at district and national levels. It can be said that the environmental regulations and policies have inclined towards the promotion of the renewable energy that will ultimately lead in the mitigation of the climate change. India has consistently demonstrated its commitment to exploring alternative energy sources for sustainable development. The journey began with a focus on hydro-power, as significant hydroelectric projects emerged in India's energy landscape. Numerous policy and regulatory measures have been implemented over time to encourage hydro-power development and attract investments. As a result, India now ranks fifth globally in terms of its substantial potential for harnessing hydro-power.¹⁵⁰ Another important sources of RE in India are geothermal and tidal energy.¹⁵¹ On one hand, geothermal energy harnesses heat for the surface of the earth from the regions with high geothermal heat flux for various purposes such as industrial application and process, cooling and heating systems, and even in agriculture and aquaculture. On the other hand, ocean/ tidal energy offers relatively offers many

¹⁴⁸ Ministry of Power, Government of India, 'भारत के विद्युत क्षेत्र का 1947 से 2021 तक का संवर्धन GROWTH of ELECTRICITY SECTOR in INDIA from 1947-2021 भारत सरकार GOVERNMENT of INDIA विद्युत मंत्रालय MINISTRY of POWER के न्द्रीय विद्युत प्रावर्करण CENTRAL ELECTRICITY AUTHORITY नई विल् ली NEW DELHI अक्टूबर' (2021) <https://cea.nic.in/wp-content/uploads/pdm/2021/12/growth_2021.pdf> accessed 1 June 2023.

¹⁴⁹ *Ibid.*

¹⁵⁰ BurAnd and NA, 'Hydropower in India Key Enablers for Better Tomorrow' (2021) <<https://www.pwc.in/assets/pdfs/publications/2014/hydropower-in-india-key-enablers-for-better-tomorrow.pdf>> accessed 5 June 2023.

¹⁵¹ Ministry of New and Renewable Energy, GOI, 'Geo-Thermal and Ocean Energy Technologies Environment Friendly Energy Sources Alternatives, Anubhav Uppal' (2019) <https://mnre.gov.in/img/documents/uploads/file_s-1582544175017.pdf> accessed 1 June 2023.

opportunities for power generation from tidal currents. India has a very long coastline, with a span of approximately 7500 km which provides access to tidal energy. Although, this is a budding concept and source of RE in India, it has a bright potential in the coming years and the growth will eventually happen in this sector. Lately, over the period of time, many innovations and developments have taken place in revolutionizing the concept of RE in the energy economics of the country. The cost of generation of the renewable technologies are significantly reducing over the past few years, especially the solar and wind energy. This substantial decline is a result of various factors, one of them is due to increase of scalability of the economies. The manufacturing and installation mechanism have become more convenient and affordable due to mass productions which ultimately resulted in the reduction of the cost per unit of wind turbines and solar panels. In addition to cutting transportation expenses, a boost in production capacity has culminated in a more localized distribution system. Noteworthy breakthroughs in technology adhering the disciplines of solar and wind energy have resulted from continuous research and development (R&D) operations. For instance, the designs are improved, the reliability and utility of RE systems have improved with the aid of manufacturing advancements. Additionally, the cost reductions in the wind and solar energy technologies have made the projects more economically feasible, operational and attractive to the investors. This will accelerate the journey to a sustainable and environmentally friendly energy future by boosting the marketability of RES.

Moreover, solar energy- based solutions have positively impacted the lives of millions of individuals in India by fulfilling their requirements for cooking, lighting, and other energy needs in an eco- friendly manner. India has an immense advantage due to its geographical location and the abundant high levels of the sunlight irradiation, makes it an ideal region for solar power generation. By attaining significant achievements in solar energy solutions, India has played a dominating role in establishment of the International Solar Alliance (ISA), which serves as a proactive, member- led, and collaborative platform aimed at accelerating the adoption and implementation of solar energy technologies.¹⁵² The administration has been actively promoting the usage of solar energy with the help numerous manoeuvre such as inauguration of large- scale

¹⁵² International Solar Alliance, 'International Solar Alliance' (*isolaralliance.org*2020) <<https://isolaralliance.org/about/background>> accessed 27 May 2023.

solar gardens and parks, installation of the solar rooftop systems, combustion of solar-wind hybrid projects. If the wind energy sector is looked upon, it is noticed that the India due to its coastal regions and hilly terrains have a significant benefit associated with the generation of the power using wind sector and energy. In the 1960s, India initiated efforts in the field of wind energy, with the National Aeronautical Laboratory (NAL) being responsible for the development of windmills primarily aimed at providing irrigation water. From then onward, India has never looked back and growing exponentially with the establishment of the taller wind turbines which have resulted in the enhancement of the efficiency and output of the wind power plants. The government has not only proactively promoted wind energy with the help of programs and policies, but also held numerous competitive auctions, wind energy zones and explored offshore wind energy plans and projects. Presently, India possesses the fourth highest wind power capacity globally, benefiting from a consistent flow of wind, particularly in the Southern, Western, and North Western regions.¹⁵³ Therefore, both wind and solar energy plays a dominant role in the endowment of nation's renewable and clean energy goals.

Biomass plays another substantial importance in the sustainable economy growth of India because it is renewable, easily accessible, carbon- neutral or net- zero. The advancement of technology has facilitated the enhanced cost-effectiveness and energy efficiency of thermal power plants. In India, biomass has been utilized in co-firing practices within thermal power plants to mitigate the carbon dioxide (CO₂) emissions associated with thermal power generation. Since the early 1990s, India has implemented a biomass power and co-generation program, leading to the installation of more than 800 projects across the country.¹⁵⁴ These projects involve biomass power generation and the utilization of bagasse and non- bagasse materials for co-generation purposes, contributing to the supply of electricity to the grid.¹⁵⁵ Furthermore, there has been an upward scale of immense improvement in the energy storage technologies and

¹⁵³ Ministry of Renewable and Energy Law, GOI, 'Overview | Ministry of New and Renewable Energy, Government of India' (*mnre.gov.in*2022) <<https://mnre.gov.in/wind/current-status/>> accessed 30 April 2023.

¹⁵⁴ Ministry of New and Renewable Energy, GOI, 'Current Status | Ministry of New and Renewable Energy, Government of India' (*mnre.gov.in*2022) <https://mnre.gov.in/bio-energy/current-status#energy_o> accessed 30 April 2023.

¹⁵⁵ Bagasse material is the dry pulpy fibrous material that remains after crushing sugarcane or sorghum stalks to extract their juice. It is used as a biofuel for the production of heat, energy, and electricity, and in the manufacture of pulp and building materials.

its integration. The utilisation of energy storage systems plays a pivotal role in effectively mitigating the issue of intermittency associated with RE sources, ensuring a consistent and dependable power supply chain. The progress of technological advancements and the decrease in energy market costs have not only resulted in improvements, but have also contributed to the enhancement of various sectors both, grid flexibility and higher penetration of the renewable in the various aspects of usages but also, helped in the boost of economic growth in India. The renewable energy sector has the capability to create substantial job prospects in maintenance, operation, manufacturing, installation, and the entire value chain that is connected with this sector. According to an independent study conducted by the Council on Energy, Environment and Water (CEEW) and Skill Councils for Green Jobs (SCGJ), the renewable energy sector in India could employ over one million individuals by 2030.¹⁵⁶ Thus, it is evident that the job creation can contribute reduce unemployment, economic stability and growth as well as endorse sustainable development. While there is an optimistic outlook for renewable energy, several challenges must be tackled to effectively integrate it. These challenges encompass the requirement for resilient grid infrastructure to handle intermittent power generation, resolving land availability concerns for large-scale projects, ensuring access to financing, and streamlining regulatory and administrative procedures.¹⁵⁷ Nevertheless, the Indian government's unwavering dedication, supportive policies, decreasing costs, and plentiful renewable resources position the country favourably for a prosperous renewable energy future.

4.3 Legal Provisions under the Constitution of India, 1950

The term “renewable energy” is not specifically mentioned under the Indian Constitution or the legislative lists. The energy sector is becoming significant with the advancement of the time, yet the peripheral aspects related to the energy is still unmentioned. Although, only the subject- matter of “electricity” is specified in the

¹⁵⁶ Press Trust of India, ‘India’s Renewable Energy Sector Can Employ 1 Million People by 2030: Study’ *The Times of India* (28 January 2022) <<https://timesofindia.indiatimes.com/business/india-business/indias-renewable-energy-sector-can-employ-1-million-people-by-2030-study/articleshow/89187263.cms>> accessed 11 June 2023.

¹⁵⁷ Humayun Tai and others, ‘The Energy Transition: A Region-By-Region Agenda for Near-Term Action’ (2022) <<https://www.mckinsey.com/~media/mckinsey/industries/electric%20power%20and%20natural%20gas/our%20insights/the%20energy%20transition%20a%20region%20by%20region%20agenda%20for%20near%20term%20action/the-energy-transition-a-region-by-region-agenda-for-near-term-action-final.pdf>> accessed 25 May 2023.

concurrent list subject Entry 38. It is important to highlight that electricity comprises both powers generated from traditional and non-traditional energy sources. According to Entry 33 of List III, Parliament has the authority to legislate on matters pertaining to trade and commerce, determination of rates and prices, and the production, supply, and distribution of industrial products when it deems it necessary for the public welfare. Along with that, the states also have accomplishment for the imposition of an additional charge on electricity, as long as it does not contradict the central act; while solar and wind energy does not fall within any specific entries of the seventh schedule, enabling Parliament to enact laws using Entry 97 of List I in conjunction with Article 248. Item 15 of the eleventh schedule mentions non- conventional energy. The entries provided in the lists of the Constitution of India are of significant importance as they delineate the distribution of legislative powers between the central government and the state governments. The non-conventional energy, also known as renewable energy sources, refers to energy sources that are naturally replenished and limitless in nature. These sources are continually generated in the environment and do not deplete over time. The key advantage of these sources is their minimal impact on the environment as they are free from pollutants. Consequently, we can harness these sources to produce clean energy without generating any waste. If the item 15 is read with the Article- 243G, then it can be interpreted that the state legislature can bestow the powers and functions of local self- government to the Panchayats in the rural areas and can prepare plans for economic development and social justice. This means the Panchayats have the authority and responsibility to support and encourage more utilization of non- conventional sources of energy within their domain. The inclusion of the eleventh schedule, introduced through the second amendment Act, encompasses various subjects. Notably, it specifically incorporates rural electrification, distribution of electricity, non-conventional energy sources (mentioned as item 15), and minor forest produce items. Therefore, inclusion of the Item 15 in the eleventh schedule shows the intention of the constitution makers to stimulate practices of sustainable energy in the developing and rural areas as well.¹⁵⁸

¹⁵⁸ Prasanth Vairavana Regy and others, 'Turning around the Power Distribution Sector: Learnings and Best Practices from Reforms' (2021) 5 RMI India <https://www.niti.gov.in/sites/default/files/2021-08/Electricity-Distribution-Report_030821.pdf> accessed 28 May 2023.

Likewise, the right to clean environment and climate are not explicitly mentioned as a standalone privilege in the Indian Constitution. However, it can be inferred from several provisions that uphold the fundamental right and the Directive Principles of the State Policy (DPSP) which are inter-connected with the sustainable development and for climate and environment protection. As Article 21 of the Constitution which “guarantees fundamental right to life, which also includes right to a clean and healthy environment.” Secondly, Article- 48A provides for “the duty of the state to protect environment and encourage sustainable development; whereas Article 51A(g) imposes duty on every citizen of the country to improve the surroundings, which includes rivers, forests and wildlife.” Thus, it can be said that if the approach of the collective reading is adopted with respect to the provisions of the Constitution of the India, one can interpret the interdependence of energy, environmentally responsible development, and the state of the environment, as well as their incorporation into a more comprehensive examination of climate change.

4.4 Contribution of the Indian Judiciary

It is important to note that the interpretation and application of constitutional provisions in specific cases depend on the judiciary’s rulings and evolving legal principles. The courts have played a significant role in recognizing and protecting environmental rights and promoting renewable energy as a means to achieve sustainable development in India.

The landmark case of *T. N Gogavaran Thirumulpad v. Union of India*¹⁵⁹ is considered as one of the most significant decisions that have played a substantial role in the environmental jurisprudence of India. The hon’ble Supreme court not only focused on the issues of environment conservation and forest safeguards by formulation of guidelines, but on the side note, also emphasized the significance of sustainable development by including the renewable energy projects.

In another landmark case of *Hindustan Zinc v. Rajasthan Electricity Regulatory Commission*¹⁶⁰, the validity of the Rajasthan Electricity Regulations, 2007 and another, Rajasthan Electricity Commission Regulations, 2010 for renewable energy were upheld

¹⁵⁹ (1997) 2 SCC 267.

¹⁶⁰ Writ Petition Civil No. 10911 of 2012.

by the hon'ble Supreme Court. It is important to discuss this case because it was held that concerning the obligation of captive generation power plants and other obligated entities, there is a requirement to fulfil the renewable energy purchase obligation (RPO) and to pay a surcharge in case of non-compliance with the RPO. Moreover, the court affirmed that the regulations established by the RERC were designed to fulfil the constitutional responsibilities of the state as outlined in Article 48A in conjunction with Article 51A (g) of the Constitution of India. These regulations align with the principles embodied in the National Electricity Policy of 2005, and the Tariff Policy of 2006. Their objective is to discourage the use of hazardous energy sources while encouraging the development of power from sources that do not deplete the earth's natural resources.

The case of *India Wind Energy Association v. Union of India*¹⁶¹ dealt with some issues of the feed-in tariff (FIT) ordinance relating to wind power projects in the state of Tamil Nadu. The hon'ble Supreme Court upheld the constitutionality of these regulations and observed the significance to promote renewable energy sources by enabling reasonable returns on investments for wind power developers.

In another case of *Alembic Pharmaceuticals Ltd. v. Rohit Prajapati & Ors.*¹⁶² the importance of the sustainable development and usage of clean and renewable energy innovations and technologies was emphasized by the court in order to reduce the environmental damages and mitigate the climate change goals.

In *Paryavaran Suraksha Samiti & Anr. v. Union of India & Ors.*¹⁶³, the hon'ble Supreme Court issued directives in order to address various pollution concerns and suggested to implement the usage of renewable energy as an alternative source of fossil fuels.

Therefore, these cases highlight the Supreme Court's contributions to environmental governing and the progress of highlighting the importance of sustainable development, in particular the efficient usage of alternative and renewable forms of energy in India. It is crucial to keep in mind that the sector of renewable energy is developing and that significant changes are about to occur. This also requires creation of a robust

¹⁶¹ Writ Petition Civil No. 700 of 2018.

¹⁶² (2020) 17 SCC 157.

¹⁶³ Writ Petition Civil No. 375 OF 2012.

mechanism and guidelines that can play a parallel role in the international dimension of the energy sector as well as help in mitigation of the climate change.¹⁶⁴

4.5 Indian Legal Regime

4.5.1 The Electricity Act, 2003

In India, the key law regulating electricity, including renewable energy (RE), is the Electricity Act of 2003 (EA 2003). The authority to create laws related to electricity is divided between the central government and the state governments.¹⁶⁵ However, if there is a repugnance or conflict between the laws enacted by the central and state governments, the central authority takes precedence over the state matters.¹⁶⁶ While the EA 2003 itself does not provide a specific definition of renewable energy (RE), other regulations have clarified the concept. For instance, the Central Electricity Regulatory Commission (CERC) issued the (Terms and Conditions for Tariff Determination from Renewable Energy Sources) Regulations 2020 under the EA 2003. These regulations define RE as “electricity generated from renewable energy sources.” Furthermore, an RE source is described in these regulations as “a renewable source of energy, including water, wind, sunlight, biomass, bagasse, municipal solid waste, and other approved sources” by the Ministry of New and Renewable Energy. The EA 2003 is a comprehensive piece of legislation that has synthesized the legal framework related to generation, conveyance, administering, dissemination and utilization of the electricity. With the objective to boost efficiency, productivity, and customer satisfaction in the power business, it superseded the former electricity Supply Act of 1948. In addition, the statute acknowledges the necessity for enhancing the electricity industry, with a particular emphasis on renewable energy (RE) development, the emerging concerns for energy security, economic development and environmentally sustainable growth. It signifies the importance in promoting energy- saving practices, promoting the usage of energy- efficient technologies, and supporting sustainable energy consumption layouts in an array of enterprises. This act does not implicitly include the provisions for non-conventional sources, but the policy and regulatory provisions indirectly related to the

¹⁶⁴Eurostat, ‘Climate Change - Driving Forces’ (*ec.europa.eu* August 2022) <https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Climate_change_-_driving_forces> accessed 7 June 2023.

¹⁶⁵ The Constitution of India, 1950, Seventh Schedule, List III (Concurrent List), Entry 38.

¹⁶⁶ *Ibid* Article 254.

RE by promoting energy efficiency and conservation applications and implementations.¹⁶⁷ Following are the salient feature of the EA 2003 that will give an overall idea about its domain as well as the renewable energy concerned for the discussion¹⁶⁸:

- 1) The Act allows the institution of distribution and generating companies, that is both private and public sectors. This has resulted in the substantial reforms in the power sector, encouraged competition in the independent power producer's domain and the renewable energy projects.
- 2) Through the creation of power transfers, this legislation facilitates transactions in electricity less complicated and advocates open participation in generation and distribution networks.
- 3) The Act delegates powers between centre and state levels by establishing a Central Electricity Regulatory Commission (CERC) that would entail the functioning of this sector. This is a key statutory body and has a quasi- judicial status under the act.¹⁶⁹ Therefore, in order to management and supervision, the commission has the power to set tariffs, quality checks and resolve the disputes among the stakeholders.
- 4) The Act also focus on the concept of Renewable Purchase Obligation (RPO)¹⁷⁰ which requires some users and supply licensees to acquire a predetermined portion of their entire power needs from RES. This feature not only promotes the utilization of RE but also enables third- party sale and purchase of electricity directly to consumers or distribution licensees, and facilitates the establishment of RE generation companies.
- 5) The Act endorses the grid connectivity of the RE based power plants as well as non- discriminatory access to the of these generators. Moreover, it ensures fairness, transparency and a sense of competitiveness in the RE developers and would result in the efficient and cost- effective acquisition and appropriation of the RE power.

¹⁶⁷ Section3 (1), 3(3) and 4 are policy provisions and Section61 (h), Section86 (1) are regulatory provisions of the EA 2003.

¹⁶⁸ Mohit Goyal and Rakesh Jha, 'Introduction of Renewable Energy Certificate in the Indian Scenario: Policy and Regulatory Provisions for Renewable Energy Power in India' (2019) 13 Renewable and Sustainable Energy Reviews 1395.

¹⁶⁹ Section- 76.

¹⁷⁰ Section 86(1) (e).

- 6) The legislation enables for the expeditious inception and performance of the RE projects by effective connection of the RE generators to the grid and by taking the tariffs.¹⁷¹ It also sets mandates for trading of Renewable Energy Certificates (RECs) for the electricity separately. Therefore, it offers renewable energy producers an opportunity to make revenue through the sustainability advantages of their production.
- 7) Apart from all the discussed aspects, the act also emphasizes on the welfare and safeguarding the rights of consumers by providing consumer redress and resolution mechanisms. The act also provides for the reliable and affordable electricity to all the people, including of village and remote areas. Additionally, it also sets penalties for non-compliance with the regulations and other offenses related with the electricity domain such as theft of electricity etc.

Therefore, the Electricity Act of 2003, through its various provisions, creates a regulatory framework that promotes the development, integration, and utilization of renewable energy sources in the electricity sector. It establishes mechanisms to incentivize renewable power generation, ensures grid connectivity for renewable energy projects, and facilitates the procurement and sale of renewable energy through competitive and transparent processes. These provisions contribute to the growth of renewable energy in India and support the country's transition towards a clean and sustainable energy future to mitigate the climate change.

4.5.2 The Electricity Conservation Act, 2005

The Electricity Conservation Act, 2005 mainly focuses on energy efficiency and conservation but it indirectly pertains the development of RE by increasing efficient usage of the electricity, promoting sustainable energy practices and reducing reliance on conventional energy sources. Additionally, the act promotes the boost and usage of energy-efficient technologies and practices, encompassing the utilization of RE technologies, while also establishing guidelines for energy efficiency standards for appliances and equipment to facilitate the adoption of renewable energy-based alternatives. It similarly gives powers and duties to the Bureau of Energy Efficiency (BEE); the aim of this study is to minimise power consumption and energy intensity

¹⁷¹ Section 3 (1).

within the economy of the nation which also includes judicious transmission, distribution and generation of the electricity. The act requires conducting energy audits, implementing energy labelling, and establishing energy efficiency standards for appliances and equipment. Therefore, the rules and regulations can be employed in such a way that will help in the formation of an environment that is favourable for the growth and integration of RES. This can be accomplished by using it in such a manner that would help for long and sustainable adaptability.

Recently, The Energy Conservation (Amendment) Act 2022¹⁷² was passed in the Rajya Sabha. The proposed legislation aims to modify the Energy Conservation Act of 2001 in order to support the attainment of the goals set during COP-26. It introduces new provisions, such as the compulsory utilization of non-fossil fuel sources and the implementation of carbon credit trading, with the aim of expediting the decarbonization of India's economy. This legislation grants the central government the authority to establish a carbon credit trading framework and establish an Energy Conservation and Sustainable Building Code. However, there is a question regarding whether the Ministry of Power is the appropriate entity to regulate this trading scheme, in other words, there is no clarity who will regulate this carbon trade market. Additionally, it is debatable whether the Act should explicitly specify the market regulator for carbon credit trading. The Bill also imposes non-fossil energy use obligations on designated consumers. However, considering the limited competition among discoms in any given area, consumers may not have the freedom to choose their desired energy mix. Likewise, this also proves as a challenge in meeting non- fossil energy use obligation. Furthermore, there is ambiguity regarding the interchangeability of renewable energy, energy savings, and carbon credit certificates, as the Bill does not provide clarity on this matter.

4.5.3 National Renewable Energy Draft 2015¹⁷³

¹⁷² Ministry of Power, GOI, 'The Energy Conservation (Amendment) Act, 2022 | Government of India | Ministry of Power' (*powermin.gov.in* 19 January 2023) <<https://powermin.gov.in/en/content/energy-conservation-amendment-act-2022>> accessed 8 June 2023.

¹⁷³ Ministry of New and Renewable Energy, GOI, 'National Renewable Energy Act 2015 (Draft) ' (*mnre.gov.in* 2015) <<https://mnre.gov.in/img/documents/uploads/68b053c5a944493e813c24a93cb39263.pdf>> accessed 27 May 2023.

In July 2015, the Ministry of New and Renewable Energy in India drafted the National Renewable Energy Act and made it available for public consultation. The primary aim of this legislation is to designate a comprehensive framework that enables the widespread integration of RE sources throughout the nation.¹⁷⁴ The draft legislation addresses various aspects such as security payments, the establishment of a grid access, RE Fund and the promotion of decentralized energy systems. Acknowledging and addressing the independent functioning of rural ministries in India's energy sector is crucial. RE development in the country has been primarily incentivized by the MNRE. However, policy and regulatory initiatives in the power sector have been less effective due to shortcomings in the compliance mechanism, despite the Electricity Act of 2003. One of the primary obstacles would be to construct a unified version of the proposed legislation that can effectively address the deficiencies that are presently unaccounted for within the prevailing regulatory and policy structure. The implementation of desired instruments can be effectively facilitated through the incorporation of a suitable coordination platform. Achieving this task will be more challenging than anticipated. It is imperative to exercise caution in order to forestall the development of previously unanticipated problems caused by unclear jurisdictional boundaries surrounding the setting of renewable energy targets, the execution of those aims, and the following adherence to those targets. It is recommended that a more efficient monitoring programme be implemented in order to achieve the goals of renewable energy development within the nation. Additionally, the draft lacks on inclusion of many initiatives such as it should incorporate 'hydrogen' as a source of RE in order to achieve its aim set in the National Hydrogen Mission, 2023 in order to promote the domestic manufacturing capabilities. The government authority is supposed to foster R&D pertaining to hydrogen as an alternative form of energy at this point in time. The present iteration of the draught necessitates refinement and broader stakeholder engagement. The implementation of an 'approved' list of manufacturers or channel partners appears to have had a detrimental impact on market competition, as it has resulted in a concentration of market power among the approved entities. This could potentially impede the efficient distribution of the subsidy to a significant number of recipients within the nation.

¹⁷⁴ International Energy Agency, 'National Renewable Energy Law 2015 - DRAFT- Policies' (*IEA-IRENA Renewables Policies Database*2021) <<https://www.iea.org/policies/5733-national-renewable-energy-law-2015-draft>> accessed 11 June 2023.

4.6 Institutional Framework

There are following key institutions that play a crucial role in the regulation and promotion of RE in the country:

- ◆ **The Ministry of New and Renewable Energy (MNRE)**¹⁷⁵ is the primary ministry of the GOI which is responsible for overseeing and coordinating all aspects related to new and renewable energy in the country. The main objective is to foster the development of new and renewable energy technologies, processes, materials, components, sub-systems, products, and services that meet global standards and performance criteria. This aims to position the country as a net earner of foreign exchange in the sector, while promoting the deployment of domestically developed and/or manufactured products and services to enhance national energy security. The functions of this nodal ministry are to formulate policies that encourages research and development (R&D), investment and the development in the RE economy that will help in the future decision- making policies. Along with R&D, the MNRE also conducts various studies, experiments, resource mapping, funding research programs, promoting collaboration and plans the potential and growth in the targeted areas. This also includes various projects such as wind, solar, biomass etc. It also provides for financial aid and support, incentives for the schemes; and helps to conduct the training programs, awareness camps and workshops. The MNRE also aims for international partnership and cooperation in order to exchange experience, expertise and knowledge in the field of RE.
- ◆ **The Ministry of Power (MOP)**¹⁷⁶ was earlier known as the Ministry of Energy sources but now, it is an independent body which is primarily answerable and accountable for the evolution of electrical energy in India. The Central Electricity Authority (CEA) is considered as the primary advisor of the ministry. It is responsible for long-term planning, creating policies, evaluating project investments, overseeing power project implementation, facilitating training and

¹⁷⁵ GOI, 'About the Ministry | Ministry of New and Renewable Energy, Government of India' (*mnre.gov.in* June 2023) <<https://mnre.gov.in/the-ministry/what-does-the-ministry-do/>> accessed 18 June 2023.

¹⁷⁶ GOI, 'About Ministry | Government of India | Ministry of Power' (*Powermin.gov.in* 2022) <<https://powermin.gov.in/en/content/about-ministry>> accessed 9 June 2023.

skill development, and managing administrative and legislative aspects related to thermal and hydro power generation, as well as transmission and distribution.

- ◆ **The Ministry of Petroleum and Natural Gas (MoPNG)**¹⁷⁷ emphasize primarily on the conventional sources of energy such as, petroleum, natural gas and petroleum products in India, but it also acknowledges the significance of renewable energy in the broader energy portfolio and actively encourages the advancement and adoption of RE technologies in targeted sectors. The ministry promotes the usage of biofuels (derived from organic matters), natural gas despite being a fossil-fuel, it is considered as a low- emission alternative to coal and petroleum. The MoPNG also plays a significant role in planning energy transition from fossil- fuels to RES. So, it helps to evaluate the potential effects of integrating renewable energy on contemporary energy assets transportation networks, and the oil and gas sectors.
- ◆ **Solar Energy Corporation of India (SECI)**¹⁷⁸ is the only Central Public Sector Undertaking (CPSU) inaugurated for the RE sector, set under MNRE to achieve the targets facilitated in the National Solar Mission, 2010. The vision of the SECI is to create an environmentally sustainable nation by harnessing the vast solar radiation available and ensuring energy security for the nation. Additionally, its mission is to promote and commercialize the utilization of solar energy in even the most remote regions of India; to take the lead in developing extensive solar installations, solar plants, and solar parks and be at the forefront of exploring and deploying new technologies for harnessing solar energy.

4.7 Significant National Policies and Missions:

India has implemented following policies and aims to achieve the goals of these missions

1) National Solar Mission 2010¹⁷⁹:

¹⁷⁷ GOI, 'AboutUs - Ministry of Petroleum and Natural Gas' (*mopng.gov.in* 21 March 2023) <<https://mopng.gov.in/en/about-us/about-the-ministry>> accessed 2 June 2023.

¹⁷⁸ GOI, 'Solar Energy Corporation of India Limited (SECI), a Government of India Enterprise, under Ministry of New and Renewable Energy' (*www.seci.co.in* 1 June 2023) <<https://www.seci.co.in/about/introduction>> accessed 7 June 2023.

¹⁷⁹ International Energy Agency, 'Jawaharlal Nehru National Solar Mission (Phase I, II and III)– Policies' (*IEA* 24 August 2022) <<https://www.iea.org/policies/4916-jawaharlal-nehru-national-solar-mission-phase-i-ii-and-iii>> accessed 24 May 2023.

It was launched in the year 2010 and the objective was to foster the evolution and development of the solar power in the country. It also focused on the measure that could be adopted in order to increase the solar capacity to 100 GW by the year 2022. A new session was held in which the said target was revised and promised to achieve a solar capacity to 450 GW by the year 2030. Additionally, the Renewable Purchase Obligations (RPOs) have established the requirement for a specific proportion of electricity consumption to be sourced from renewable energy, thereby providing a reliable market for the development of renewable energy initiatives. The mission has truly boosted the research and development in this sector, increased scalability of the solar projects and have benefitted with the financial incentives with the help of various programs such as Solar Park Schemes and Jawaharlal Nehru National Solar Mission (JNNSM). Moreover, the government has extended the Safeguard Duty (SGD) on the domestic solar panel to boost the economy of the nation.¹⁸⁰

2) National Wind Mission 2014¹⁸¹:

It was introduced in the year 2014, the mission aims to promote the development of wind power in India and increase the wind capacity to 60 GW by 2022 (revised to 140 GW by 2030).¹⁸² It focuses on various aspects such as wind resource assessment, technology development, and capacity building.

3) National Offshore Wind Energy Policy 2015¹⁸³:

It was introduced in the year 2015, this policy aims on the development of offshore wind energy projects along India's coastline. The main objective to tap into the

¹⁸⁰ Nitin Thomas Prasad, 'India Extends Imposition of Safeguard Duty on Solar Imports by Another Year - Mercom India' (*Mercomindia.com* 29 July 2020) <<https://www.mercomindia.com/india-extends-safeguard-duty-solar-imports>> accessed 1 June 2023.

¹⁸¹ WORLD SOCIAL REPORT, 'Climate Change: Exacerbating Poverty and Inequality in a Rapidly Changing World' (2020) <<https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/02/World-Social-Report-2020-Chapter-3.pdf>> accessed 13 May 2023.

¹⁸² Ministry Of New and Renewable Energy, 'Ministry of New and Renewable Energy Evaluation of Wind Energy in India Twenty-Seventh Report Lok Sabha Secretariat New Delhi' (2022) <https://loksabhadocs.nic.in/lsscommittee/Energy/17_Energy_27.pdf> accessed 2 June 2023.

¹⁸³ Ministry of New and Renewable Energy, GOI, 'Offshore Wind | Ministry of New and Renewable Energy, Government of India' (*mnre.gov.in* 2 April 2023) <<https://mnre.gov.in/wind/offshore-wind/>> accessed 3 June 2023.

vast offshore wind potential and sets out guidelines for grid connectivity, project development, growth and environmental sustainability.

4) Unnat Jyoti by Affordable LED for All (UJALA) Program 2015¹⁸⁴:

The program was launched by Prime Minister of India, Shri. Narendra Modi to encourage usage of LED bulb, tube lights and energy efficient fans in order to replace conventional and inefficient alternatives to the residential consumers.

5) National Wind Solar Hybrid Policy 2018¹⁸⁵:

The policy was introduced in the year 2018 by the Ministry of New and Renewable Energy, GOI in order to promulgate the large grid connected solar- wind photovoltaic (PV) hybrid mechanisms for the effective and efficient utilization of land and transmission infrastructure.

6) National Policy on Biofuels 2018¹⁸⁶:

The policy was introduced in the year 2018, this policy aims to promote the production and efficient usage of the biofuels in India. It encompasses incentives for biofuel production, goals to blending biofuels with fossil fuels, and the promotion of research and development in the bioenergy sector of the nation. Later, in the year 2022, an amendment to this policy came with the intention to promote biofuel units by the units located in the Economic Zones (SEZ) or Export Oriented Units (EoUs); and certain restriction on the exports of feedstock were removed.

7) National Policy on Hydro-power 2019¹⁸⁷:

It was introduced in the year 2019, this policy aims to accelerate the expansion of hydropower projects in India while considering social and environmental aspects.

¹⁸⁴ Energy Efficient Services Limited, 'UJALA– Energy Efficiency Services Limited' (*eeslindia.org*2015) <<https://eeslindia.org/en/ourujala/>> accessed 27 May 2023.

¹⁸⁵ Ministry of New and Renewable Energy, GOI, 'National Wind-Solar Hybrid Policy' (*pib.gov.in*30 November 2021) <<https://pib.gov.in/newsite/PrintRelease.aspx?relid=227282>> accessed 26 May 2023.

¹⁸⁶ Ministry of Petroleum and Natural Gas, GOI, 'National Policy on Biofuels-2018 Amendment, 2022' (*mopng.gov.in*2022) <<https://mopng.gov.in/en/page/11>> accessed 21 May 2023.

¹⁸⁷ Ministry of Power, GOI, 'Measures Taken to Promote Hydro Power in India' (*pib.gov.in*10 August 2021) <<https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1744435>> accessed 26 April 2023.

It emphasizes the efficient utilization of water resources, sustainable development, and stakeholder participation.

8) Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM) 2019¹⁸⁸:

PM-KUSUM was introduced by MNRE in 2019 for the farmers. This scheme aimed to achieve the goal to introduce Solar energy-based power plants (SEPP) varying from the capacity to target small scale farmers or groups. It also boosted the installation and solarisation of solar powered pumps on the barren lands and for the purpose of crops and agricultural produce till the year 2026.

9) National Mission and Sustainable Habitat (and Energy Efficiency) 2021¹⁸⁹:

This scheme is one of the key missions under the National Action Plan on Climate Change (NAPP). The main target sought to be achieved the energy efficiency in the buildings, conservation initiatives and public transportation¹⁹⁰; adapting to Climate Change by imposing the resilience of infrastructure, adjusting to the effects of climate change by strengthening the resilience of our infrastructure, instituting community-based disaster management, and taking steps to improve our early warning system for the most severe weather occurrences.

10) Nationally Determined Contribution (NDC) 2022¹⁹¹:

The Union Cabinet approved the updated NDC that was discussed during COP26 in UNFCCC by India. It aims to elevate India's efforts in supporting global initiatives to combat climate change, as outlined in the Paris Agreement. This will

¹⁸⁸ Ministry of New and Renewable Energy, GOI, 'PM-KUSUM' (*pmkusum.mnre.gov.in*2019) <<https://pmkusum.mnre.gov.in/landing-about.html>> accessed 3 May 2023.

¹⁸⁹ Ministry of Housing and Urban Affairs, GOI, 'National Mission on Sustainable Habitat 2021-2030 Ministry of Housing and Urban Affairs Government of India NATIONAL MISSION on SUSTAINABLE HABITAT | 1' (2021) <<https://mohua.gov.in/upload/uploadfiles/files/NMSH-2021.pdf>> accessed 5 April 2023.

¹⁹⁰ Central Public Health and Environmental Engineering Organization, 'National Mission on Sustainable Habitat: Adaptation and Mitigation Measures in the Field of Water Supply & Sanitation' (*smartnet.niua.org*2014) <<https://smartnet.niua.org/content/91c0bcd4-4ce8-41ac-9a11-34e72f6b74ae>> accessed 5 May 2023.

¹⁹¹ The Union Cabinet, Government of India, 'Cabinet Approves India's Updated Nationally Determined Contribution to Be Communicated to the United Nations Framework Convention on Climate Change' (*pib.gov.in*3 August 2022) <<https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1847812>> accessed 26 April 2023.

facilitate the transition to sustainable growth paths with reduced greenhouse gas emissions. The act prioritizes the nation's interests and ensures the preservation of its future development requirements, guided by the principles and provisions of the UNFCCC. The updated version of NDC includes, "to put forward and further propagate a healthy and sustainable way of living based on traditions and values of conservation and moderation, including through a mass movement for 'LIFE'— 'Lifestyle for Environment' as a key to combating climate change." For instance, India's UJALA LED campaign is contributing to reduction of GHG emission by 40 million tonnes per year and it has successfully completed 7 years of affordable and energy- efficient supply and distribution¹⁹²; also, the ambition of Indian Railways to achieve a Net Zero Target by the year 2030 will solely lessen the emission by 40 million tonnes annually. India has consistently demonstrated its commitment to taking a leading role in addressing climate change. The nation's vision encompasses various short-term objectives to achieve Net Zero Emissions by the year 2070 by expanding renewable energy capacity to 500 GW by 2030; Meeting half of energy needs through renewable sources; decreasing emissions intensity of nation's GDP by 45% and cumulative emissions by one billion tonnes by the year 2030.¹⁹³

11) National Green Hydrogen Mission 2023¹⁹⁴:

India has set ambitious goals to achieve energy self-sufficiency by the year 2047 and reach Net Zero emissions by 2070. The mission was approved by the Union Cabinet on January 2022 and aimed to achieve the goal to create export latitudes for Green Hydrogen. Hydrogen has versatile applications, including long-term storage of renewable energy, substitution of fossil fuels in industrial processes, environmentally friendly transportation, and the potential for decentralized power generation, aviation, and marine transport. The objectives included a leading supplier and producer Green Hydrogen across the globe; promotion of domestic

¹⁹² Ministry of Power, GOI, 'UJALA Completes 7 Years of Energy-Efficient and Affordable LED Distribution' (*pib.gov.in* January 2022) <<https://pib.gov.in/PressReleasePage.aspx?PRID=1787594>> accessed 7 May 2023.

¹⁹³ *Ibid.*

¹⁹⁴ National Portal of India, GOI, 'National Green Hydrogen Mission| National Portal of India' (*www.india.gov.in* 4 January 2022) <<https://www.india.gov.in/spotlight/national-green-hydrogen-mission>> accessed 1 April 2023.

manufacturing capabilities; economic development and creating job as well as industry opportunities; decrease in reliance on imported fossil fuels and feedstock; and aiding R&D projects.

12) National Mission on Strategic Knowledge for Climate Change (NMSKCC)¹⁹⁵

In November 2022 while updating NDC, the Indian government submitted a distinct framework document entitled “India’s Long-term Low Carbon Development Strategy” to the secretariat of the United Nations Framework Convention on Climate Change (UNFCCC). The document outlines India’s objective to achieve net-zero emissions by the year 2070. The mission has undergone a revision process to ensure that its objectives and priorities are in accordance with the commitments of the nation. The Government has initiated several schemes and programmes, such as the National Action Plan on Climate Change (NAPCC), which encompasses missions that target specific areas such as solar energy, energy efficiency, water, sustainable agriculture, Himalayan ecosystem, sustainable habitat, green India, health, and strategic knowledge for climate change. The Department of Science and Technology has implemented the National Mission on Strategic Knowledge for Climate Change (NMSKCC) as part of the National Action Plan on Climate Change (NAPCC). The mission intends to facilitate research, knowledge generation, and capacity building in the field of climate science.

13) Draft National Electricity Policy, 2021¹⁹⁶

The NEP 2021 draught exhibits a commendable intent, however, it requires complementary modifications to the National Tariff Policy and the Electricity Act, 2003, to establish a cohesive framework that can facilitate India’s transition towards achieving energy self- sufficiency. It is currently in the process of being drafted by a committee consisting of representatives from various state governments, the Ministry of New and Renewable Energy, NITI Aayog, the

¹⁹⁵ Ministry of Environment, Forest and Climate Change, GOI, ‘National Mission on Strategic Knowledge for Climate Change (NMSKCC)’ (*pib.gov.in* December 2022) <<https://pib.gov.in/PressReleasePage.aspx?PRID=1883746#:~:text=The%20National%20Mission%20on%20Strategic>> accessed 3 June 2023.

¹⁹⁶ Ministry of Power, GOI, ‘Draft National Electricity Policy, 2021’ (*powermin.gov.in* 2021) <https://powermin.gov.in/sites/default/files/webform/notices/Inviting_suggestions_on_draft_NEP_2021_0.pdf> accessed 12 June 2023.

Central Electricity Authority, and Central Public Sector Undertakings, among other entities. The committee is being chaired by Shri Gireesh Pradhan, a retired Chairperson of the Central Electricity Regulatory Commission. The mission of this policy is to promote sustainable and clean generation of electricity; incorporation of efficient markets for electricity; Revamping of Discoms; provision of dependable and high-quality electricity according to predefined standards in an effective manner; utilization of the efficient markets for this sector and a step towards light touch regulation. The long-term vision of this policy is, “a financially viable and environmentally sustainable power sector furthering energy security and providing reliable 24x7 power at a reasonable price.” The objectives encompass decarbonization and energy transition, an agile and flexible grid, the economic sustainability of the power sector, and a consumer-centric proximity. The present emphasis ought to be directed towards the process of decarbonization, rather than the complete elimination of coal usage within the sector. Enhancing the flexibility of current coal-based power generation has the potential to facilitate a greater proportion of renewable energy integration in the future. The reduction of RE output is implemented for both operational and commercial purposes.

It is recommended that the regulatory framework require the system operator to keep a comprehensive record of all occurrences of RE curtailment, including relevant system parameters. This will facilitate analysis aimed at identifying the underlying reasons for curtailment that can be attributed to system constraints. The Distribution System Operator (DSO) is a crucial player in facilitating the expansion RE, enhancing the operational efficiency of the industry, and fostering competition in the retail energy industry. Therefore, the evolutionary trajectory of a DSO ought not to rely on the implementation of the separation of carriage and content. Rather, such separation could be introduced subsequently and facilitate the DSO's advancement. Similarly, the consideration of energy security and clean energy has become an essential component of significant investment determinations. The objective of decreasing energy intensity is a crucial aspect of the decision-making process within the sector, as it facilitates a seamless transition towards clean energy over an extended period.

Chapter-5

Conclusion and Suggestions

5.1 Challenges for development of Renewable Energy in India

There are some challenges and confrontation related to the growth of RE which acts as a setback in the development of RE and sustainable economy in the country; they are discussed as following:

- i) There has been a lack of effective coordination between the central and state governments regarding renewable energy matters, resulting in confusion, delays, and mismanagement in areas such as auctions, transmission connectivity, and land acquisition for renewable energy projects at both levels of governance.
- ii) A significant number of power plants in India were established several years ago and have subsequently become outdated and inefficient. As a consequence, the growth rate in electricity generation has been relatively low in recent years.
- iii) One major issue of concern is the delayed payments from financially strained state-owned distribution companies, which has created challenges in the renewable energy sector.¹⁹⁷
- iv) The implementation of trade duties on imported solar modules has been found to have negative consequences, creating disruptions and counterproductive outcomes. In 2018, the government introduced a 2-year import duty with the aim of safeguarding the domestic solar manufacturing sector.¹⁹⁸ However, this duty has not resulted in a reduction in imports or substantial improvements in the competitiveness of domestically produced solar cells. As a result, the growth of solar installations has been hindered.

¹⁹⁷ Biswajeet Kumar, 'Remaining Challenges for Renewables in India' (www.indiaspend.com 21 August 2021) <<https://www.indiaspend.com/data-viz/renewable-energy-challenge-distribution-companies-forecasting-grid-infrastructure-768928>> accessed 7 May 2023.

¹⁹⁸ Ministry of Commerce and Industry, GOI, 'Subject: Safeguard Investigation Concerning Imports of "Solar Cells Whether or Not Assembled in Modules or Panels" into India -Final Findings -Proceedings under the Customs Tariff Act, 1975 and the Custom Tariff (Identification and Assessment of Safeguard Duty) Rules, 1997 -Reg' (2018) <https://www.dgtr.gov.in/sites/default/files/Solar-Final_Finding-English_0.pdf> accessed 1 June 2023.

v) The expansion of transmission networks and balancing capacity in the country has been progressing at a sluggish pace.

vi) The presence of stranded or non-performing assets in India's thermal power sector is posing financial challenges for the development of renewable energy sources.

vii) The presence of aggressive tariff caps during auctions and retrospective re-negotiations is a prevalent issue throughout India. This raises concerns regarding sovereign risk for foreign investors.

viii) Smaller renewable energy generators in India face financial constraints due to several reasons such as high capital costs, limited access to finance, complicated regulatory environment, difficulty in negotiating in the Power Purchase Agreements (PPAs) etc.¹⁹⁹

Apart from the above- mentioned problems and hurdles, the others had been discussed in the previous chapters with the coherent study with the international framework and the initiatives undertaken to achieve the global aim of energy for all which is sustainable, clean and will directly help to mitigate the circumstance prevailing in the environment and deal with the climate change at grass root level.

5.2 The solution

5.2.1 At National level:

There is a numerous solution which can be provided to achieve this vision; here researcher has tried to deal with the most possible and accurate measures by elucidating the concerns to the full potential. There is a need for a robust legal framework which is stable, certain, consistent, and unified in order to meet the country's demand for energy through the environmentally responsible development of RE sources. The rapid depletion of non- RES along with the concerns about the environment, clean innovation, and effects on environmental change present a fit instance for the construction of a resilient legal structure for the promotion of renewable energy in India. Liberalisation, globalisation, privatisation, and urbanisation are all factors that

¹⁹⁹ Gopal Sarangi, 'ADBI Working Paper Series GREEN ENERGY FINANCE in INDIA: CHALLENGES and SOLUTIONS Asian Development Bank Institute' (2018) <<https://www.adb.org/sites/default/files/publication/446536/adbi-wp863.pdf>> accessed 5 June 2023.

contribute to this fit case. The imperative for enacting legislation pertaining to renewable energy assumes significance owing to the necessity of overseeing diverse initiatives and schemes of considerable magnitude, which are instituted and backed by the Ministry of New and Renewable Energy (MNRE), and entail the coordination of multiple nodal agencies at both the federal and provincial levels. It is advisable for the nations to integrate some measures into their Energy and Climate legislation framework, in alignment with the principle of precaution.²⁰⁰ In instances where governing bodies pledge to decrease greenhouse gas emissions, it is imperative that they do so in accordance with the precautionary principle, for instance, taking various fiscal measures, adopting different forms and regulations which include RE which is efficient and sustainable, measures to reduce GHGs; and market based instruments that can help effective control of the carbon tax and emission trading. As discussed in the above chapters, the dearth of a well-defined approach towards the advancement of RE in our nation persists, despite the paramount importance of attaining energy security and accessibility in India. This is primarily due to the absence of a singular, all-encompassing policy declaration or legislation that comprehensively outlines the progression of diverse energy alternatives to effectively accomplish these objectives. This has not limited to these lacking, in addition, there have been non- mandatory policies implemented on a continuous basis to promote the growth of specific RE technologies. The lack of a comprehensive national legislation has resulted in the implementation of multiple laws and policies governing the development of RE. This projected to the increase of ambiguity, conflict, confusion, and delays in the majority of similar Renewable Energy projects. RE is subject to regulation by both the federal and state governments. Hence, the implementation of plans or objectives established by the federal government may not always come to fruition, as state governments are not bound to formulate or synchronise their renewable energy policies with those of the federal government.

It is proposed that Part IV of the Constitution of India be amended to incorporate fundamental obligations of the state pertaining to energy, similar to the Constitution of

²⁰⁰ Rosemary Lyster and Eric Coonan, 'The Precautionary Principle: A Thrill Ride on the Roller Coaster of Energy and Climate Law' (2009) 18 *Review of European Community & International Environmental Law* 19.

Switzerland.²⁰¹ The implementation of measures aimed at protecting and broadening the scope of renewable energy sources would enable the state to effectively address the aforementioned issues. Furthermore, it is possible that the courts may adopt a flexible and cohesive approach when interpreting other provisions of the Constitution, including those pertaining to fundamental rights, in relation to this matter. The Constitution outlines the fundamental duties of its citizens. None of the extant fundamental duties address the issue of energy. The attainment of development goals by the government is a challenging task in the absence of adequate involvement of the citizens. The energy sector similarly necessitates the active involvement of individuals in order to achieve efficient and sustainable energy utilisation and conservation.²⁰² Likewise, the importance of the awareness regarding their rights and duties cannot be ignored, this can be achieved by various schemes and awareness programs for all. Moreover, there must be a balance between the administration system i.e., practical “cooperative federalism” is suggested so that different level of governments can work together in coherence and are able to achieve the common goals addressing the complex issues which requires collaboration. There must be some sort of amendment in the Seventh Schedule by adding a new entry in the List 1 such as “renewable energy and form of inexhaustible sources of energy to be of national importance.” The List II can be made subject to the above- mentioned which will help to ensure a balanced perspective in the matter concerned.

Another suggestion can be imperative to prioritise the development of capacity over the mere generation of power. The acquisition of land is a significant issue that requires a delicate balance between the concerns of farmers and the interests of developers involved in renewable energy projects. Moreover, the matter of benefit sharing as a means of motivating farmers whose land is being procured for a RE project should be duly taken into account. Nevertheless, an equitable and uncomplicated financial and disbursement system targeted towards consumers that is transparent and provides assurance over a reasonable duration could significantly

²⁰¹ The Federal Constitution of the Swiss Confederation, 1999, art. 89 (1) <<https://www.admin.ch/opc/en/classified-compilation/19995395/index.html>> accessed 15 June 2023.

²⁰² Manisha Gulati and Piyush Tiwari, ‘Development of Renewable Energy in India: Role and Effectiveness of Electricity Regulators’ (2012) 2 Renewable Energy Law and Policy Review 110.

facilitate the acceleration of RE development.²⁰³ The establishment of an intermediary institution is recommended to provide financial assistance. The existence of potential duplicative redundancies among these subsidies, coupled with frequent revisions and significant variations in financial support provided by different states, has resulted in an investment and project development environment that is characterised by uncertainty. Banks or other financial institutions fund most medium- and large-scale power ventures. In such a circumstance, fair-term financing and funding are essential for most projects. This has been another risky area for India's sustainable power source projects. Most significant Indian infrastructure firms have well-utilized asset records, limiting their ability to inject equity into new projects. However, the banking system is failing to balance advances and non-performing assets (NPA), making market finance for RE projects challenging. Since many sectors are taking steps to lower bank NPAs, the general trend has been to be cautious when lending for high-risk long-term projects. Given the state discoms' liquidity issues and uncertainties, the renewable energy sector will be especially affected. In the event of PPA non-availability or operational profit margin failure, banks may seek strict securities or contract safeguards, making debt-financed projects in this sector burdensome. It is imperative to establish predetermined fixed rates and durations for tariffs to ensure a level of predictability and certainty. It is recommended to refrain from utilising a universal approach that is applicable to all types of RE sources. Instead, it is advisable to implement distinct tariffs for various energy sources and projects of the same energy source due to the significant differentiation that exists based on the technology employed and the scale of the project.

It would be appropriate to make some modifications to the Electricity Act of 2003 and Electricity Conservation Act of 2005 to incorporate detailed provisions of renewable energy into their legislation. It is strongly encouraged that the Energy Conservation Building Code should include a compulsory requirement for the implementation of solar water heating systems and energy-efficient building techniques, such as the installation of solar panels, for both government and privately-owned structures. Also,

²⁰³ Dolf Gielen and others, 'The Role of Renewable Energy in the Global Energy Transformation' (2019) 24 Energy Strategy Reviews 38
<<https://www.sciencedirect.com/science/article/pii/S2211467X19300082>> accessed 19 June 2023.

there is a need to include a new dedicated Renewable Energy Act; the implementation of a unified national law would address the challenge of disparate state regulations, thereby fostering a regulatory climate that is equitable, consistent, and supportive of investment. This, in turn, would facilitate the expansion of the RE industry in India and enhance its prospects for growth. The Indian RE sector has not been able to expand to the level that it should have been able to since there is no explicit legislation, there is no central carbon pricing mechanism, and there is no perpetual incentive plan for RE generation. Along with that, an arbitration and mediation clause can be added to the future legislation. As it is known that the Public- Private Partnership business model is used for the majority of the RE projects, which are joint ventures between the government and several global corporations. So, these arbitral mechanisms can be proved to be of great substantial benefit, unlike judicial process which often are time consuming, lengthy and costly. It is also suggested that the proposed amendment mandates the financial intermediary to provide incentives and subsidies. In order to integrate RE as a central strategy of infrastructure expansion, national policies should encourage energy transformation planning as part of a larger infrastructure development. This should be done as part of broader infrastructure development. Therefore, in order for the successful implementation of RE generation and distribution in areas served by a grid, it is imperative that customers are provided with the seamless ability to connect their on-site renewable systems to the grid. Numerous policies have been established through legislative or regulatory means in different jurisdictions. Typically, these policies entail a small system benefit charge per kWh, which is collected by utilities and deposited into a Public Benefit Fund (PBF) for the benefit of electricity consumers. The Non-Fossil Fuel Obligation (NFFO) has been successfully implemented in several countries including the Ireland, United States, Brazil, Netherlands, Germany and the United Kingdom.²⁰⁴

The inclusion of Research and Development (R&D) as a compulsory provision in the original Act would offer significant momentum to the RE sector, such as the electrification of rural households and the provision of energy for education and healthcare. The topic of discussion pertains to grid feeding and isolated mini grids,

²⁰⁴ UNEP-Pace University Law School Energy and Climate Center and Katherine Kennedy, 'The Importance of Renewable Energy' (2016) 5 UN Environment Guide for Energy Efficiency and Renewable Energy Laws 144.

which involve the utilisation of renewable energy sources such as wind farms, small-scale hydropower, geothermal, biomass, water, agriculture and commercial purposes.²⁰⁵ Similarly, the education and awareness can boost renewable energy development. Exhibitions and demonstrations raise awareness and consumer confidence in RE solutions; training engineers, scientists, and researchers developing innovative RE technologies; policy analyst training for effective policymaking and scientists, engineers, and technicians who develop, install, maintain, and train RE systems are in limited number. Governments need energy management staff and related courseware for schools. Similar to India, countries like Germany, Australia, Japan, and China relied heavily on coal, crude oil, and natural gas, but their extraordinary national efforts to promote and operate RE are widely embedded in EU trade policies like carbon cap-and-trade which also boosted their economies.²⁰⁶

It is essential that the legislation include a provision, which would require periodic review and potential revision of the law or policy every five years, in order to address the changing landscape of issues related to RE. The justification for establishing the targets should consider diverse advantages and disadvantages as previously outlined, such as safeguarding the environment, diminishing the commercial and financial shortfall, minimising water demands and ensuring energy autonomy. There is also a need of a Feed- In Tariff policy which is a governmental policy that establishes a predetermined price, typically at a level that remunerates renewable energy producers for the elevated expenses associated with production. Flexible and innovative mechanisms such as Feed-in Tariffs (FIT) have been recognised as highly effective tools in promoting energy security, reducing the impact of climate change, as well as fostering the development of environmentally sustainable employment possibilities.²⁰⁷ The FIT essentially offers an assurance that any electricity generated will be utilised, either by consumers or through purchase by the State. Additionally, a notable advantage of FIT is that these remunerations are typically granted to producers prior to the commencement of production. It is imperative to strive towards achieving coherence among governmental procedures and regulatory bodies, while simultaneously

²⁰⁵ Ranidipa Ghosh, 'Renewable Energy: Recourse to Human Induced Climate change' 7 GJLDP 127.

²⁰⁶ Gallagher, Kelly Sims, 'Why & How Governments Support Renewable Energy' (2019) Daedalus 142.

²⁰⁷ Namrata Mukherjee, 'Short Note: Feed in Tariffs: A policy tool for Green and Equitable Development', 2 (2014) ELSJ 7.

implementing innovative and sustainable strategies to optimise the functionality of renewable energy systems. The integration of more accurate information pertaining to the actual expenses and frequent fluctuations of clean energy is a viable solution. Additionally, it is imperative that regulatory bodies refrain from utilising policies and legislation as a means of coercion.

In order to comply with Renewable Portfolio Standards (RPS/ RPOs), power providers are required to include renewable resources within their portfolios of electricity generation. The Renewable Portfolio Standards serve to provide a level of market protection for the various producers of renewable energy. The primary goal of RPS mandate is to establish economic competitiveness between power generated from renewable sources and power derived from petroleum-based sources. At the outset, a number of states around the globe have incorporated RPS policies into their electric industry restructuring efforts. In recent times, they have instituted diverse policies via legislative measures or proceedings that are separate from restructuring endeavours. India has responded to growing global pressure to address rising emissions while maintaining its commitment to growth and development. One notable action taken by India in this regard is the establishment of the largest solar park in Asia, demonstrating the country's efforts in the field of RE creation.²⁰⁸

India has prioritised the issue of climate change through bilateral initiatives, in addition to engaging in business deals. This has highlighted the importance of the international coordination and cooperation. On the top of that, domestic jurisprudence is also substantial at the very same time; there exists a mutual concern between local authorities and their constituents to foster regional economic growth and facilitate the advancement of sustainable energy pioneers. Because local governments possess knowledge about local conditions that may be used to determine which technologies would be the most efficient, it is imperative that municipal authorities be given a voice in the decision-making process. Doing so will assist in ensuring that the procedure combines both liberal and decentralised theme. The successful implementation of this

²⁰⁸ Times of India, 'Discovering Rewa, Home to Asia's Largest Solar Power Plant and White Tigers!' *The Times of India* (July 2020) <<https://timesofindia.indiatimes.com/travel/destinations/discovering-rewa-home-to-asias-largest-solar-power-plant-and-white-tigers/articleshow/77125558.cms>> accessed 9 June 2023.

endeavour necessitates the presence of both political will and political support. To attain the intended goal, a sturdy legal and regulatory framework is imperative.

5.2.2 At International Level

There are numerous measures that can be taken at international level with the purpose to address the conditions of RE, but for the present study, relevant measures are discussed that will help to improve the RE as well as mitigate with the climate changes at international level. The advancement of the RE sector necessitates global collaboration, which involves granting developing and underdeveloped nations access to cutting-edge technology by developed countries, while adhering to the principle of equity. More importantly, it is imperative to tackle international trade barriers by means of international collaboration, given the absence of a treaty or international organisation that specifically addresses renewable energy effects in climate change regime. It is proposed that a specialised agency be established under the United Nations with a specific focus on sustainable energy development. This agency could be re-defined after the International Atomic Energy Agency (IAEA), which was founded in 1957 to facilitate the global advancement of nuclear energy. Considering the substantial financial implications involved in establishing a novel agency, it may be more viable to augment the mandate of the International Atomic Energy Agency (IAEA) and rebrand it to encompass all aspects of sustainable development of energy. Establishing ambitious and quantifiable objectives for the implementation of RE on a global scale offers a distinct trajectory and incentivizes nations to intensify their endeavours in shifting towards the natural and renewable energy resources.

It is advocated that the UNGA adopt a parallel declaration pertaining to sustainable energy, similar in structure to the Universal Declaration of Human Rights of 1964. This declaration would serve to promote sustainable energy practises in general, or alternatively, to specifically endorse the utilisation of RE sources and energy efficiency measures. So, establishment of frameworks that encompass regulatory mechanisms, financial incentives, and supportive infrastructure can facilitate the establishment of a conducive environment to facilitate the advancement of RE. This entails promoting international cooperation, facilitating the exchange of experiences, and sharing knowledge pertaining to RE and climate change among nations. Through collaborative efforts, nations can gain insights from each other's triumphs and obstacles, cultivating

a communal strategy for tackling these worldwide concerns. Therefore, the mainstreaming of renewable energy into national energy systems necessitates the implementation of well-crafted policy frameworks.

In accordance with an ecologically sound energy declaration, it is conceivable to embrace a novel worldwide accord that promotes sustainable energy, or alternatively, append a new protocol to an existing convention on sustainable energy.²⁰⁹ Adopting the latter course of action entails the possibility of appending a novel sustainable energy protocol to either the United Nations Framework Convention on Climate Change (UNFCCC) or the Energy Charter Treaty (ECT). Given the huge number of nationalities that have already acknowledged the treaty, the United Nations Framework Convention on Climate Change (UNFCCC) seems to be the most appropriate vehicle. and the strong connection that exists between both the dimensions of energy consumption and climate change. The developing world, in their endeavour to establish sustainable energy infrastructure and climate change initiatives, often face financial barriers that can be overcome through financial support, particularly from developed nations, facilitating their transition to clean energy sources. Additionally, enhancing technology transfer by sharing advanced renewable energy technologies, along with the associated knowledge and skills, can bridge the technological gap and promote the widespread adoption of renewable energy. Therefore, enhancing the technical, managerial, and institutional proficiencies of nations, particularly those in the developing regions, it is crucial to guarantee the effective formulation, implementation, and management of RE endeavours. Capacity building programmes are essential in equipping individuals with the requisite expertise and understanding to facilitate the shift towards a sustainable and clean renewable energy.

In the conclusion, addressing the challenges of renewable energy and climate change requires a collective and concerted effort at the international level. By embracing collaborative approaches, providing financial support, facilitating technology transfer, strengthening policy frameworks, and investing in capacity building and research and development, we can pave the way for a sustainable and low-carbon future. The effective resolution of the urgent matters of renewable energy deployment and climate change mitigation necessitates the employment of innovative solutions, shared

²⁰⁹ Joseph P. Tomain, 'The Democratization of Energy' 48 (2015) V and. J. Transnat'l L 1137.

responsibilities, and international cooperation. Collectively, everyone should endeavour to achieve an environmentally sustainable planet that is cleaner, more verdant, and better equipped to withstand challenges for both current and forthcoming generations.

5.3 Concluding Remarks

It is clear from the examination and research that India possesses a major opportunity to emerge as a frontrunner in the domain of renewable energy and has the capacity to attain complete self-sufficiency in electricity production, even in the face of its substantial reliance on fossil fuels, provided it settles to pursue this course of action. Several Indian states experience a deficit in fossil fuels and thus rely on importing approximately two-thirds of their fossil fuel demand from other states to meet their energy needs. Conversely, there exist numerous states that possess substantial resources such as extensive coastlines, as well as onshore and offshore resources. Research has indicated that the combined utilisation of solar and wind resources has the potential to satisfy the entire anticipated energy demand. However, the absence of strong incentives, inadequate legal and institutional frameworks, non-standardized regulations, insufficient technological advancements, inadequate public awareness, inconsistent priorities, and insufficient political willpower are the primary obstacles hindering the attainment of energy security and the provision of fundamental human necessities to the populace. The examination of methodologies adopted by other nations or individual states can serve as a source of motivation for Indian legislators, given the comparable circumstances between many of these countries and states and India. Through the utilisation of comparative analysis, deficiencies and necessary adjustments to the models implemented by these nations can be discerned. Additionally, Renewable energy can boost rural economies due to the decentralized nature of RE. After studying the cases studies and best practises, it can be concluded that economic reasons, political factors, cultural acceptance, and resource endowment strongly influence policy decisions in India. Since India imports most of its energy, policymakers may be motivated to aggressively promote renewable energy. Therefore, political will and notably environmental and climate change awareness can help achieve goals. It is imperative to establish a resilient legal institutional framework for RE that prioritises key objectives such as enhanced economic growth, job creation, and competitiveness,

while simultaneously addressing climate change concerns. Another benefit is that this framework should aim to reduce atmospheric pollutants, improve the general well-being, and bolster energy security.

Therefore, the importance of renewable energy, sustainable development, and climate change in India cannot be overstated. The use and advocacy for the use of renewable energy sources have important repercussions for India's socio-economic growth, environmental sustainability, and global climate commitments. It is essential for India to lessen its dependence and reliance on fossil fuels if the country hopes to fulfil its obligation to meet its energy needs, as well as lessen the impact of climate change, renewable energy plays a critical part in all three of these endeavours. India has the potential to attain energy security, encourage the development of technological innovations, and create job prospects in the renewable energy sector if it takes advantage of the immense solar, wind, and hydro resources that are accessible in the country. In addition, the incorporation of renewable energy sources into India's energy portfolio fosters sustainable development by establishing a more equitable and ecologically conscious strategy for economic advancement. The implementation of a variety of energy sources, in conjunction with energy efficiency strategies, has the potential to aid in the preservation of resources, decreased levels of pollution, and the advancement of air quality, ultimately resulting in improved living conditions and better public health results. This will not only prove to safeguard the rights of persons that are affected by the widespread violation of the climate change, but also impact the ecology and system. Further, India's loyalty to mitigating climate change via the utilisation of RE sources is imperative not solely for its own enduring advancement but also for worldwide endeavours aimed at countering climate change. Its endeavours to reduce GHGs emissions are not only in line with worldwide climate objectives but also demonstrate its leadership in transitioning towards a low-carbon economy. Therefore, enhancing global partnerships, fostering R&D, and incentivizing public-private collaborations are essential measures towards expanding the implementation of RE and attaining SDGs and objectives.

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